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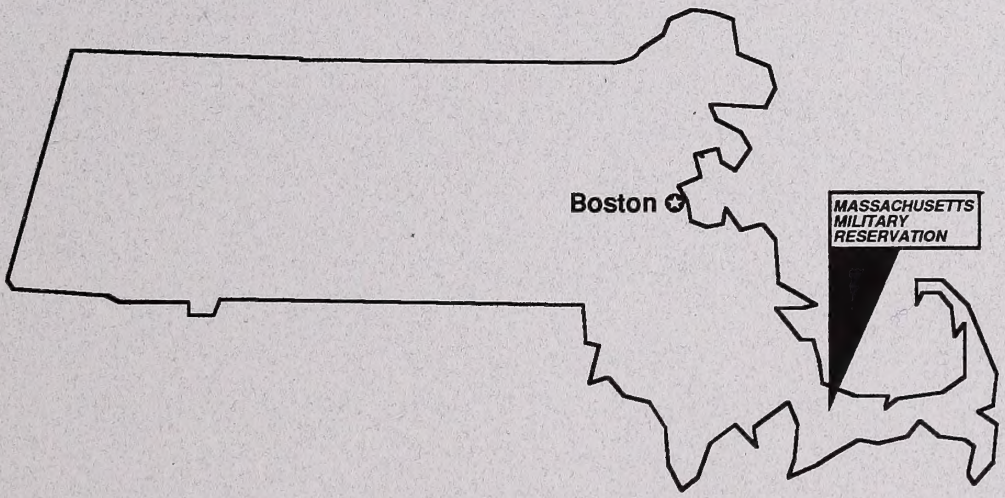
ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT
EOEA No. 5834



MASSACHUSETTS MILITARY RESERVATION FACILITIES UPGRADE

Prepared for:
The National Guard Bureau and
Massachusetts National Guard

NOVEMBER 1996

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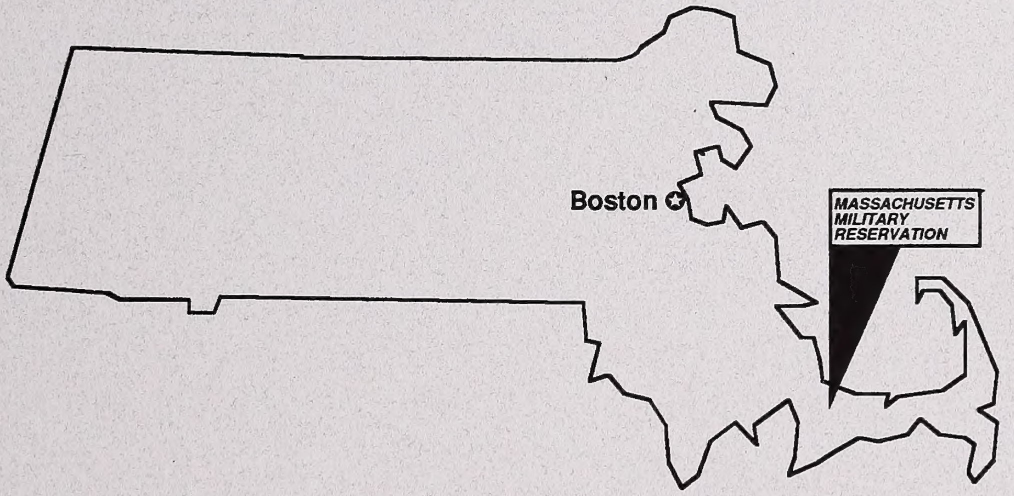

MASSACHUSETTS MILITARY RESERVATION FACILITIES UPGRADE

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Massachusetts National Guard

NOVEMBER 1996

THE COMMONWEALTH OF MASSACHUSETTS
SPECIAL MILITARY RESERVATION COMMISSION
UNIFIED ENVIRONMENTAL PLANNING OFFICE
CAMP EDWARDS, MA 02542-5003

MG Raymond A. Vezina
The Adjutant General, Chairman
MG Alan T. Reid
Commander MA ANG, Commissioner
BG Willliam A. Quigley
State Quartermaster, Commissioner

(508) 968-5824
FAX (508) 968-5818
DSN 557-5824

3 January 1995

Diane Ranney
Jonathan Bourne Public Library
19 Sandwich Road
Bourne, MA 02532

Dear Ms. Ranney,

Enclosed is a copy of the ***Certificate of the Secretary of Environmental Affairs on the Notice of Project Change,*** for the proposed projects at the Massachusetts Military Reservation (MMR). Request the certificate be placed on file along with the documentation you currently have on file concerning the MMR Environmental Impact Statement/Environmental Impact Report.

Please feel free to contact me at (508) 968-5824/5908 if you have any questions. Thank you.

Vicki A Moore

VICKI A. MOORE
Environmental/Public Affairs
Unified Environmental Planning
Office

Encl
as

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The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, 02202

WILLIAM F. WELD
GOVERNOR
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LIEUTENANT GOVERNOR
TRUDY COXE
SECRETARY

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CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE NOTICE OF PROJECT CHANGE

PROJECT NAME : Massachusetts Military Reservation Master Plan
PROJECT LOCATION : Bourne, Falmouth, Mashpee, Sandwich
EOEA NUMBER : 5834
PROJECT PROPONENT : Mass. Army National Guard
DATE NOTICED IN MONITOR : October 24, 1994

Pursuant to the Massachusetts Environmental Policy Act (G.L., c.30, s.61-62H) and Section 11.17 of the MEPA regulations (301 CMR 11.00), I have reviewed the Notice of Project Change submitted on the above project and hereby determine that it **requires** the preparation of an Environmental Impact Report.

This master planning project was originally filed with MEPA in January of 1986 and at that time the plan contained 58 separate projects. A Certificate was issued on February 10, 1986 requiring the preparation of an Environmental Impact Report (EIR). The required EIR was never filed.

Subsequently, a Notice of Project Change (NPC) was filed in December of 1992 that reduced the number of projects to 17. A Certificate was issued on that NPC on March 18, 1993 requiring the preparation of an Environmental Impact Report and refocusing the scope to reflect the change in the project.

The reduction in scope of the plan at that time was the result of two factors: (1) some project elements were allowed to proceed without further MEPA review by the February 10, 1986 Certificate (and have now been completed) and (2) others had been eliminated due to changes in training requirements.

The current NPC describes a project that includes 10 elements; 6 Army Guard project and 4 Air Guard projects. After consideration of the comments received on the prior NPC and after obtaining agreement and funding from the National Guard Bureau,

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the proponent has requested a rescoping for purposes of incorporating the Air Guard projects in the EIR and focusing the EIR on the proposed project elements as well as the cumulative effects of all activities on the base. It is my opinion that a crisply focused and carefully prepared EIR remains the most effective means of addressing these issues.

The EIR will thus serve not only as an assessment of the potential environmental impacts of implementation of the master plan but also as a vehicle for analyzing these potential impacts in the broader context of all activities on the base. It has been frequently argued by neighbors of the base and environmental advocacy groups that the EIR should provide an assessment and analysis of the cumulative effects of the plan on the full extent of activities on the base and on the environmental consequences of those activities. I agree and I expect that this broader analysis will be provided in the EIR. I do not expect, however, that the EIR will resolve the issue of apparently elevated cancer rates on the Upper Cape or whether the base is implicated in this matter as some commentors suggest. I note, however, that the Agency for Toxic Substances Disease Register is doing a health assessment around the base and that the Massachusetts Department of Public Health has given a $1.2 million grant to the Silent Spring Institute to conduct a study of cancer rates in the towns around the base. The EIR should report the sources of contaminants on the base, the nature and concentration of those contaminants, and the direction of movement of those contaminants. This information should be useful to other agencies investigating cancer rates and their causes.

The MAARNG has not been idle during the interval between the 1986 Certificate and the current Notice of Project Change. The studies required for the Installation Restoration Program (IRP) have been completed and implementation has begun; archaeological surveys have been completed and the MAARNG has instituted a cultural resources management plan; rare plant and animal species surveys have been completed and recommendations of Massachusetts Natural Heritage Program (MNHP) have been adopted; the MAARNG has undertaken to study the air quality implications of propellent bag burning on the base and the studies should be complete at this writing; demolition of dilapidated structures and rehabilitation of other structures has begun; conversions to natural gas fuels for space heating have been completed; removal of underground storage tanks is underway; and studies have been conducted to determine the noise impacts of base activities on the local community. This information and analysis, coupled with the information required by this scope, should provide the basis for a thorough and comprehensive EIR.

The proponent has agreed to file the Draft EIR within 40 weeks of the issuance of this Certificate. This timetable, although not as short as some would like, will allow for careful and thorough analysis as well as internal review of the document in Washington. I will entertain written requests for an extension of this timetable where cause can be shown, as is customary with filing deadlines under MEPA.

The proponent has also requested that I assist in establishing a Community Working Group (CWG), the details of which will be developed in the near future. I agree that such a group might be useful in development and review of the environmental documents and I will commit my staff to assist in the establishment and organization of such a group.

I further believe that everyone would benefit from annual updates on projects, planning, remediation and other activities on the base following the completion of the EIR. These updates need not be formalized under the MEPA process but should be provided to MEPA, the Community Working Group, the communities involved, and to other interested parties.

The required EIR shall follow the outline contained at 301 CMR 11.07, shall address the issues raised in the attached comments, and shall address the following specific issues.

BACKGROUND DESCRIPTION

The EIR shall contain a history of past projects on the base and a complete description of the base and all activities that occur on the base whether conducted on the Massachusetts Military Reservation, Otis Air Force Base, or the Coast Guard Station. The EIR should provide information on person-day use of the base, broken down by state or federal entity, by week end and week day for typical days in February, May, August, and October. The study should then describe typical operations on the base during such times so as to allow a complete understanding of aircraft operations, light and heavy arms activity, and other activities with potential bearing on noise, air quality and groundwater.

The background section should also provide clear plans and maps of the base and the facilities and should include an detailed inventory of resource areas located on the base.

This section should provide the reader with a clear understanding of the intensity of use of the base and the aggregate military activities occurring on the base. This shall constitute the baseline against which the potential impacts of the master plan activities will be measured.

REVISED MASTER PLAN DESCRIPTION

The Revised Master Plan consists of 10 elements divided into 4 Air Guard projects and 6 Army Guard projects. The EIR shall describe each element in terms of location, mission or function, construction and operation requirements, and frequency and intensity of use.

This section should provide a clear description of any changes from similar elements identified in the 1985 Master Plan and from what currently exists at the base.

NOISE

The Army Environmental Hygiene Agency has conducted several noise studies on the base including development of Installation Compatible Use Zone contours for noise from base activities. The EIR should contain the results of these studies and evaluate them in terms of the requirements of the 1986 scope and this Certificate.

The EIR shall discuss the criteria used for evaluating the noise environment at the base. The base is unique in that the noise environment is punctuated by high-intensity short-duration noise (artillery, small arms, machine guns), machinery noise (trucks, tanks, etc.), and aircraft noise that in some cases occur together.

The EIR shall identify what means are available to minimize noise impacts from the base, which of these means are incorporated into the design of the new master plan, and what the overall effect of this mitigation is on the adjacent properties.

AIR QUALITY

The EIR shall identify all sources of air contaminants attributable to operation of the base, including propellent burning but not including the controlled burn program which is the subject of prior MEPA review.

The EIR shall then analyze the cumulative effect of these sources, insofar as their emissions might occur together, and assess the effects of these contaminants on downwind receptors using the prevailing wind direction during the time of occurrence.

WATER QUALITY

The base is a known source of contaminated groundwater. The DEP and the United States Environmental Protection Agency are currently concluding assessment activities on the site and, simultaneously, undertaking remedial actions such as capping the existing landfill, installing groundwater containment and remediation systems, and performing contaminated soil remediation. Additionally, these agencies have established a public participation process that includes several Process Action Teams to oversee and advise on the clean-up activities. The EIR shall summarize the assessment, containment, and remediation efforts that have been, or are being, planned and implemented on the base. This section should consider multi-media and cumulative effects in dealing with ground water contamination on the base.

The EIR will also report on the extent of contamination in the central Impact Area caused by exploded and unexploded ordinance and small arms fire and describe a clean-up protocol if required. The EIR should also present a monitoring scheme to ensure groundwater protection in the future.

There are several Zone IIs for public wells that extend onto the base. The EIR should present a policy for protection of these resources in relation to current and future activities on the base.

DISTRIBUTION

The EIR shall be distributed according to 301 CMR 11.24 and, in addition, shall be distributed to the Selectmen, Planning Boards, and Water Departments of Bourne, Falmouth, Mashpee and Sandwich, and to all parties that filed comments on the Notice of Project Change. In addition, four copies each shall be placed in the public libraries of the four communities.

December 8, 1994
DATE

Undersecretary
Trudy Coxe, Secretary

DRAFT
ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT
EOEA No. 5834

MASSACHUSETTS MILITARY RESERVATION FACILITIES UPGRADE

Prepared for:

U.S. Department of the Army
National Guard Bureau
and
Massachusetts National Guard

Prepared by:

The Commonwealth of Massachusetts
Military Division
Office of the State Quartermaster
Camp Curtis Guild
Reading, Massachusetts

NOVEMBER 1996

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DRAFT ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT

LEAD AGENCY: U.S. Department of the Army, National Guard Bureau

PROPOSED ACTION: Massachusetts Military Reservation (MMR) Facilities Upgrade

AFFECTED JURISDICTION: The Commonwealth of Massachusetts, Barnstable County, Towns of Bourne, Sandwich, Falmouth and Mashpee

PROPONENTS: National Guard Bureau and Massachusetts Military Division (MMD).

PREPARED BY: Louis R. Volpe, Colonel, State Quartermaster, MMD, Camp Curtis Guild, Reading, MA 01867-1999

REVIEWED BY: Edward G. Baca, Lieutenant General, Chief National Guard Bureau Raymond A. Vezina, Major General, The Adjutant General, Massachusetts National Guard

APPROVED BY: Mr. Ray Fatz, Acting Deputy Assistant Secretary of the Army (Environment, Safety, and Occupational Health)

ABSTRACT: The Department of the Army, National Guard Bureau and Massachusetts Military Division propose to upgrade and develop five range projects, and renovate and construct five operations facilities to support the current mission and maintain the readiness of the Massachusetts National Guard. Project alternatives, including no action, described in this Environmental Impact Statement/Environmental Impact Report (EIS/EIR) were analyzed to determine project-related individual and cumulative impacts regarding air quality, noise, water resources, biological resources, land use, cultural resources, hazardous materials and hazardous waste management, utilities, transportation and socioeconomics. Studies concluded that implementation of any of the project alternatives with ongoing or recommended mitigation measures, including the preferred alternative (Alternative 1 for each of the proposed projects), can be carried out with minimal impact on the environment.

A Notice of Availability (NOA) will be published in the Federal Register, Environmental Monitor, and local newspapers notifying the general public, concerned organizations and federal and state agencies having jurisdiction or special expertise that the Draft EIS/EIR is available and subject to a 90-day comment review period. For additional information, please contact the Massachusetts Military Division, Office of the State Quartermaster, Attn: Mr. Shaun Cody, Director of Environmental Affairs, Camp Curtis Guild, Haverhill Street, Reading, Massachusetts 01867-1999; telephone (617) 944-0500 ext. 2525, facsimile (617) 944-0500 ext. 2543.

PREFACE

This Draft Environmental Impact Statement/Environmental Impact Report (EIS/EIR) addresses the proposed upgrade and development of five range projects and five operations support facilities required to support the current mission and maintain the readiness of the Massachusetts National Guard. This EIS/EIR examines the potential project-related environmental impacts associated with implementation of the Proposed Action in accordance with the National Environmental Policy Act (NEPA), Massachusetts Environmental Policy Act (MEPA), Army Regulations 200-1 and 200-2 and Air Force Instruction 32-7061. This EIS/EIR was also prepared in accordance with a 1989 Consent Decree (Appendix A) resulting from litigation involving the Conservation Law Foundation of New England, Inc. The organization of this EIS/EIR is as follows:

EXECUTIVE SUMMARY, available under separate cover, summarizes the contents and coverage of the draft EIS/EIR.

SECRETARIAL DECISIONS includes the MEPA Certificates which determine, in part, the scope of this document.

SECTION 1.0 - PURPOSE AND NEED FOR THE PROPOSED ACTION describes the project purpose and need, NEPA/MEPA process, project history and scope of analysis, public participation efforts, and regulatory framework.

SECTION 2.0 - PROJECT DESCRIPTIONS AND ALTERNATIVES describes the proposed projects, presents the alternatives development and screening criteria process, and identifies the project alternatives included for analysis.

SECTION 3.0 - AFFECTED ENVIRONMENT - MMR presents a baseline description of the installation including a description of the existing physical, biological, social, and economic conditions pertaining to MMR.

SECTION 4.0 - ENVIRONMENTAL CONSEQUENCES describes the potential individual and cumulative project-related environmental impacts (including any mitigation) associated with the Proposed Action and project alternatives.

SECTION 5.0 - REFERENCES includes the documentation referenced during the development of this EIS/EIR, and the persons and agencies consulted.

SECTION 6.0 - LIST OF PREPARERS identifies those individuals who prepared this Draft EIS/EIR.

SECTION 7.0 - DISTRIBUTION LIST presents a list of the federal and state agencies, local municipalities and organizations, and individuals who received this draft EIS/EIR for review and comment.

APPENDICES includes background documents, information, correspondence, and technical data that substantiates the analysis presented in this draft EIS/EIR.

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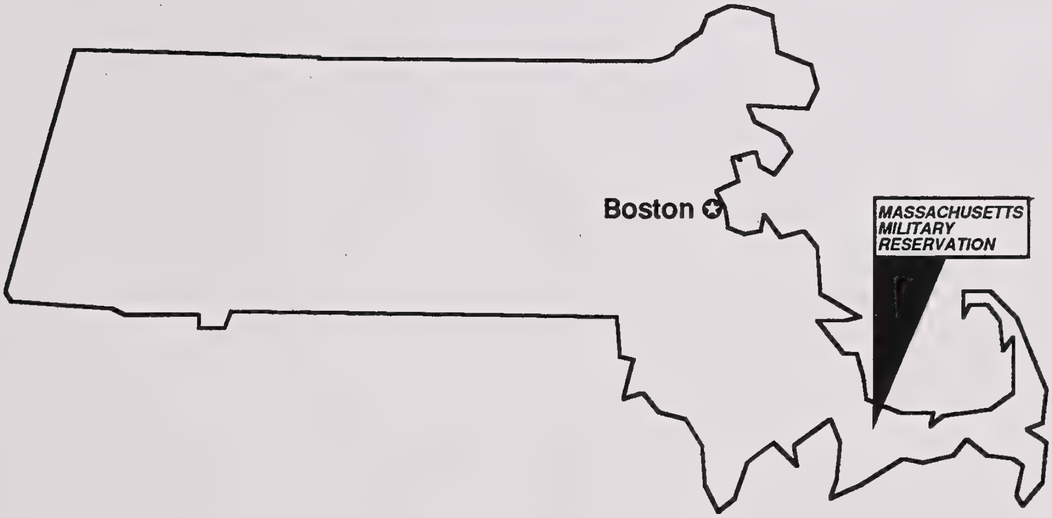
ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT
EOEA No. 5834



MASSACHUSETTS MILITARY RESERVATION FACILITIES UPGRADE

Prepared for:
The National Guard Bureau and
Massachusetts National Guard

NOVEMBER 1996

EXECUTIVE SUMMARY

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DRAFT
ENVIRONMENTAL IMPACT STATEMENT/ ENVIRONMENTAL IMPACT REPORT
EOEA No. 5834

MASSACHUSETTS MILITARY RESERVATION FACILITIES UPGRADE

Prepared for:

U.S. Department of the Army
National Guard Bureau
and
Massachusetts National Guard

Prepared by:

The Commonwealth of Massachusetts
Military Division
Office of the State Quartermaster
Camp Curtis Guild
Reading, Massachusetts

NOVEMBER 1996

EXECUTIVE SUMMARY

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THE COMMONWEALTH OF MASSACHUSETTS
MILITARY DIVISION
THE ADJUTANT GENERAL'S OFFICE
CAMP CURTIS GUILD
HAVERHILL STREET, READING, MA 01867-1999

In reply refer to

MAAR-AG

November 27, 1996

SUBJECT: Public Review of *Draft* Environmental Impact Statement/Environmental Impact Report for the Massachusetts Military Reservation Facilities Upgrade

To Interested Parties:

Enclosed for your review and comment is a copy of the *Draft* Environmental Impact Statement/Environmental Impact Report (EIS/EIR) for the Massachusetts Military Reservation (MMR) Facilities Upgrade. The Massachusetts Military Reservation is located on Cape Cod in the four townships of Bourne, Falmouth, Mashpee, and Sandwich. This document addresses the environmental impacts of the proposed facilities upgrade at the MMR, which consist of two major components: the upgrade and construction of five training ranges and the upgrade and construction of support facilities.

The environmental impacts related to the Proposed Action for each alternative and the No Action alternative are addressed in the *Draft* EIS/EIR, Section 4.0. This environmental document is written in compliance with the National Environmental Policy Act (NEPA) of 1969 as directed by the Council of Environmental Quality (CEQ), Massachusetts Environmental Policy Act (MEPA), Army Regulation 200-2 and other applicable environmental laws and regulations.

A ninety (90) day public review and comment period for this *Draft* EIS/EIR is provided commencing December 2, 1996 and ending March 3, 1996. The complete document and the Executive Summary will be available for review at each of the public libraries in Bourne, Falmouth, Mashpee, and Sandwich as well as the U.S. Coast Guard Library on the Reservation. Copies of the document and the Executive Summary may be obtained through the Unified Environmental Planning Office on Camp Edwards.

Open houses have been scheduled from 6:00 p.m. until 8:30 p.m. on Tuesday, December 17, 1996 at the Bourne High School; Thursday, December 19, 1996 at the Morse Pond School, Falmouth; Tuesday, January 7, 1997 at the Middle School, Mashpee; and Thursday, January 9, 1997 at Forestdale School, Sandwich. The public hearing is scheduled for January 15, 1997, at

the Morse Pond School, Falmouth. Comments can be made at any of these sites or they can be sent to the following address:

Mr. Donald Consolmagno
EIS, Public Affairs Officer
Unified Environmental Planning Office
Building 1204
Camp Edwards, MA 02452

The National Guard Bureau, with support from the Massachusetts National Guard and the Department of Army, is conducting a ground water study at the MMR to determine the effects of range training operations on the ground water beneath the Impact Area. The *Draft* EIS/EIR will not become a *Final* document until data gathered from this study is incorporated into the document.

If you have any questions regarding this document, please call Mr. Consolmagno or Mr. Ernest Keating at (508) 968-5824. We will also accept your comments via FAX at (508) 968-5818. Finally, the EIS/EIR Project now has a World Wide Web page that allows for comments to be electronically mailed to us. The Web page address is http://www.tiac.net/users/mmreis. Thank you for your review of this document.

Sincerely,

Raymond A Vezina

Raymond A. Vezina
Major General, MAARNG
The Adjutant General

MASSACHUSETTS MILITARY RESERVATION
FACILITIES UPGRADE
ENVIRONMENTAL IMPACT STATEMENT/
ENVIRONMENTAL IMPACT REPORT

EXECUTIVE SUMMARY

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EXECUTIVE SUMMARY

INTRODUCTION

This Environmental Impact Statement/Environmental Impact Report (EIS/EIR) addresses the environmental impacts related to the proposed facilities upgrade for the Massachusetts National Guard. The Massachusetts Military Division (MMD) in conjunction with the National Guard Bureau (NGB) has proposed 10 projects to support the mission of the Massachusetts Army and Air National Guard (MAARNG and MAANG, respectively). For ease of presentation, these 10 actions have been split into the following five Range Projects and five Cantonment (administrative or operational support) Projects:

Range Projects

1. Modified Record Fire Range (MRFR): used to train and qualify soldiers on the M16 rifle.

2. Multi-Purpose Machine Gun Transition Range (MPMR): used to train and qualify soldiers on various machine guns and the sniper rifle.

3. Infantry Squad Battle Course (ISBC): used to train infantry soldiers on how to conduct small group tactical movements and attack enemy positions.

4. Military Operations on Urbanized Terrain-Military Assault Course (MOUT-MAC): used to train individuals or small groups on techniques used in urban combat situations.

5. Military Operations on Urbanized Terrain-Collective Training Facility (MOUT-CTF): the continuation of MOUT training used to train small or large group techniques used in urban combat situations.

Cantonment Projects

6. Unified Training Equipment Site (UTES): a facility used to store and maintain vehicles and equipment assigned to Camp Edwards.

7. Airfield Control Tower: a facility that houses air traffic control personnel and equipment.

8. Aircraft Generation Unit Facility (AGU): an aircraft hangar used to conduct minor pre-flight maintenance activities on aircraft assigned to Otis Air National Guard Base (ANGB).

9. Fire Station: a facility that houses fire protection personnel and equipment.

10. Environmental Facility: an administrative facility that houses Otis ANGB environmental personnel.

Should the decision be made to go forward with these projects, construction is anticipated to be completed by the year 2000.

SCOPE OF DOCUMENT

A joint National Environmental Policy Act/ Massachusetts Environmental Policy Act (NEPA/MEPA) document was prepared because implementation of the proposed projects involves both federal and state agencies. In addition, this EIS/EIR was prepared in accordance with a 1989 Consent Decree resulting from litigation involving the Conservation Law Foundation of New England, Inc. The NGB is the federal co-lead agency providing funding and approval authority subject to NEPA. MMD is the state lead agency under MEPA and a co-lead agency under NEPA responsible for approving and implementing the projects. The agencies listed above served the following roles during preparation of this EIS/EIR:

- NGB provided project technical assistance and document review.
- Department of the Army provided document review.
- MMD authored the document and provided project management and coordination, technical assistance, document quality assurance and control, and technical review.

BACKGROUND

In June 1985, the MAARNG issued an Environmental Assessment (EA) to address the potential environmental consequences of the 1985 Camp Edwards Master Plan. Subsequently, the NGB approved the EA and issued a Finding of No Significant Impact in December 1985. Following litigation involving the Conservation Law Foundation of New England, Inc., a Consent Decree was negotiated and executed in September 1989. This EIS/EIR addresses those issues identified in the 1989 Consent Decree which are relevant to the proposed projects.

In accordance with Massachusetts regulations, MAARNG also submitted an Environmental Notification Form (ENF) regarding the Camp Edwards Master Plan to the Massachusetts Executive Office of Environmental Affairs (EOEA No. 5834). The ENF was published in the Environmental Monitor on January 10, 1986. As a result, the Secretary issued a Certificate on February 10, 1986, requiring the preparation of an EIR for the proposed Master Plan projects.

Subsequent to the 1989 Consent Decree, MAARNG submitted a Notice of Project Change (NPC) to the Secretary regarding a revision to the Camp Edwards Master Plan reducing the number of proposed projects from 56 to 17. This NPC was published in the Environmental Monitor on December 22, 1992. In response, the Secretary issued a Certificate on the NPC on March 18, 1993, requiring the preparation of an EIR for the remaining 17 revised Master Plan projects.

On October 12, 1994, MAARNG submitted a second NPC that reduced the number of MAARNG projects from 17 to six and added four MAANG projects, for a total of 10 projects. This NPC was published in the Environmental Monitor on October 24, 1994. Consequently, the Secretary issued a Certificate on the NPC on December 8, 1994, requiring the preparation of an EIR for the 10 currently proposed projects.

On October 25, 1995, the Secretary granted an extension for filing the Draft EIR. As a result, the EIR was to be submitted to the Secretary in September 1996. An additional 45 day extension was then requested by MAARNG to coordinate the impact area study with this document, resulting in a November 1996 submittal of the EIR.

PURPOSE AND NEED

The purpose of the proposed facilities upgrade is to provide the necessary training and facilities to maintain the readiness of the Massachusetts National Guard to stay current with changing military training and doctrine. Military units must maintain a high level of training and state of readiness to support national defense and state missions in times of natural disaster, civil unrest, and other emergencies. Reductions in the nation's active military forces during the past decade have placed an even greater emphasis on the mission of the Reserve and Guard forces. Adequate training opportunities must be available for military units to achieve their mandated readiness goals, which can only be attained with modern equipment, training and support facilities.

PUBLIC PARTICIPATION

In addition to soliciting public and agency comment on this Draft EIS/EIR, the NGB, Massachusetts National Guard, and EOEA implemented steps to keep the public informed regarding the 10 proposed projects both prior to and during preparation of this document. The following public participation methods were used:

- A Public Scoping Meeting was held at the Morse Pond School in Falmouth on November 2, 1994, to identify potential alternatives and public concerns associated with the 10 proposed projects. This meeting included information booths staffed with MAARNG and MAANG personnel to answer questions and provide technical background on the 10 projects, and a discussion panel consisting of representatives from EOEA, NGB, MAARNG, and MAANG.

- Quarterly Newsletters (four) to update the public on the status of the Draft EIS/EIR and other associated issues have been mailed to approximately 1,300 people.

- A Community Working Group. The EOEA solicited a 12 to 15 person membership. However, only eight individuals have volunteered to date. As a result, EOEA has chosen not to activate the working group.

- The Unified Environmental Planning Function office at MMR provides an additional on-site resource available to the public for information regarding the status of the EIS/EIR.

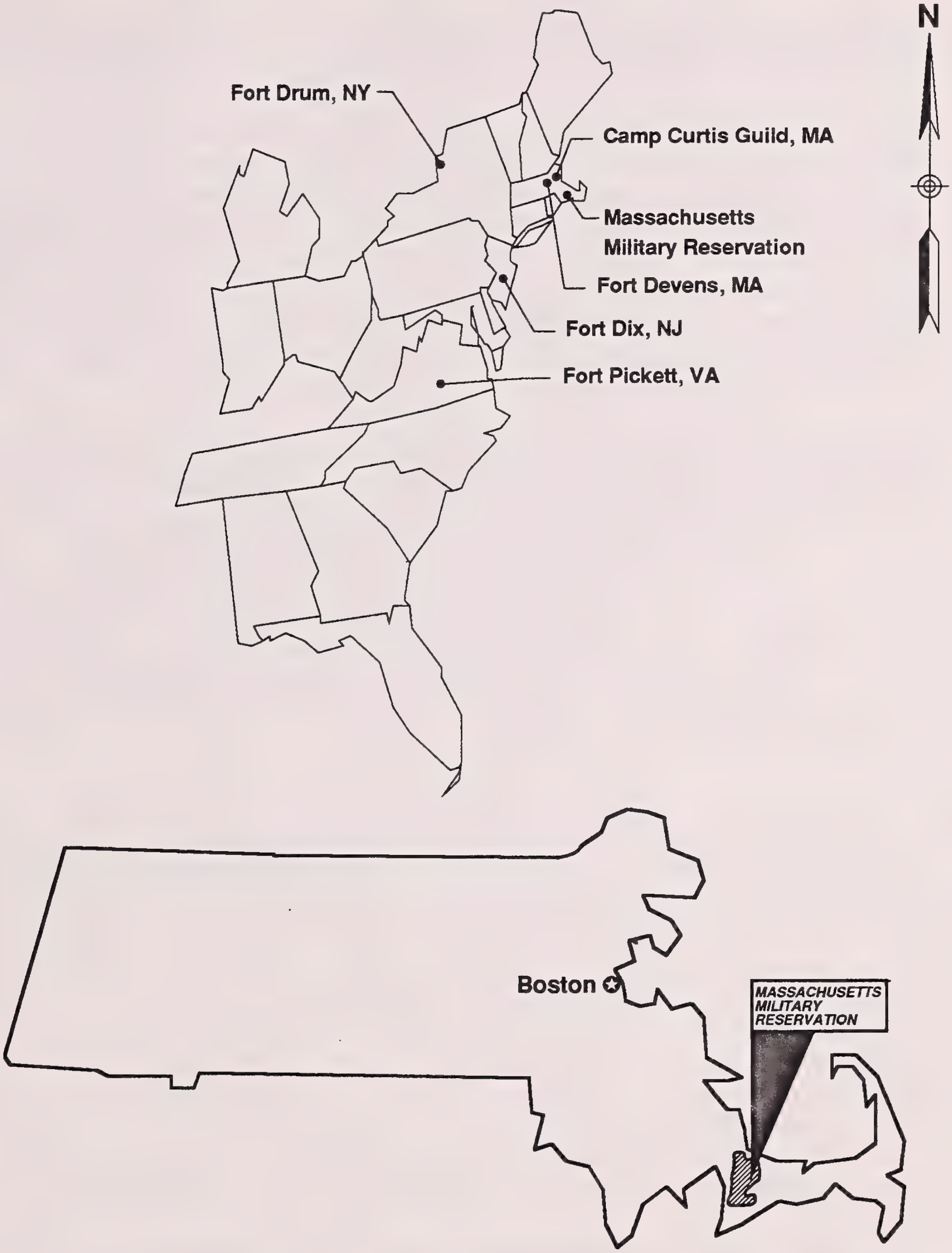
- Public information sessions (open houses) will be held in Falmouth, Bourne, Mashpee, and Sandwich following release of the Draft EIS/EIR and prior to the public hearing.

- The public comment period has been expanded from 45 to 90 days to allow for additional public input.

- MAARNG has established a web page (http://www.tiac.net/users/mmreis) that provides information on the proposed projects and the EIS/EIR.

ALTERNATIVES

Military installations outside and within Massachusetts were considered as site locations for the 10 proposed projects (Figure ES-1). Three military installations outside of Massachusetts including: Fort Pickett, Virginia; Fort Dix, New Jersey; and Fort Drum, New York were considered. Travel time to these locations is far above what is



SITE LOCATION EVALUATION AND MMR VICINITY MAP

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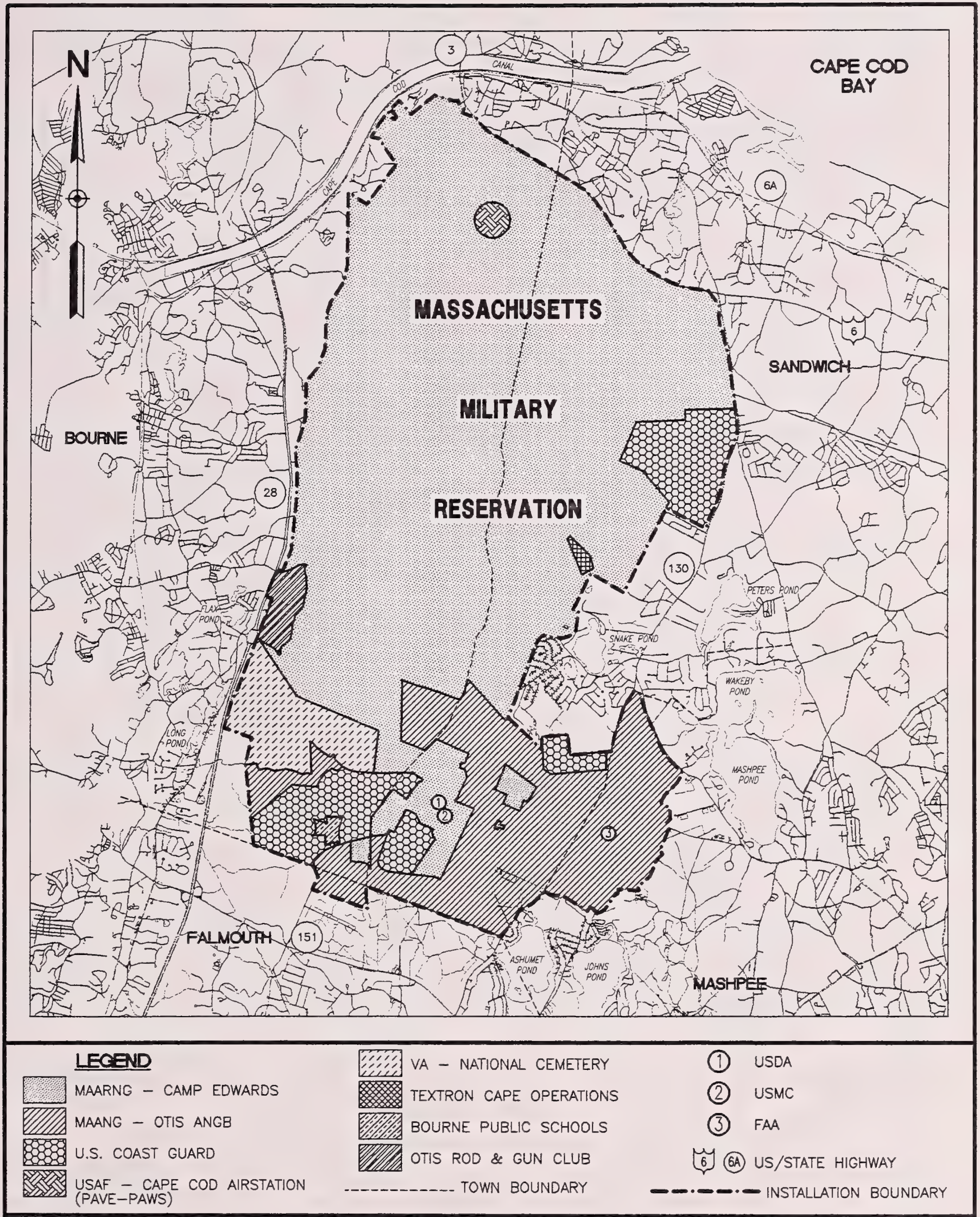
Figure ES-1

recommended in NGB training manuals. The Army National Guard training manual (NGR AR 350-1, Army National Guard Training) requires travel to a site be, at most, 25 percent of available training time. Therefore, these installations were eliminated from further consideration. Fort Devens, Camp Curtis Guild, the Massachusetts Military Reservation (MMR), and other Massachusetts National Guard Properties were also considered as site locations for the proposed projects. With the exception of MMR, the other locations do not provide the ranges, training areas, support facilities and/or land requirements necessary to operate the proposed projects. Therefore, MMR remained as the only practicable location for the proposed projects.

MMR is located on the upper or western portion of Cape Cod in Barnstable County, Massachusetts, approximately 60 miles south of Boston and immediately southeast of the Cape Cod Canal (Figure ES-1). The towns of Falmouth, Bourne, Sandwich and Mashpee intersect on MMR property. MMR occupies approximately 21,000 acres of land owned primarily by the Commonwealth of Massachusetts and is controlled by several cooperating occupants (Figure ES-2). These occupants include, but are not limited to, the MAARNG, the MAANG, the U.S. Air Force, the U.S. Coast Guard, the Veterans Administration, the U.S. Marine Corps, the U.S. Department of Agriculture, the Federal Aviation Administration, Textron Cape Operations (an independent DoD Contractor), and the Bourne Public Schools.

Alternate locations for the Range and Cantonment Projects at MMR were evaluated based on operational and tactical screening requirements. After considering these screening requirements, a number of alternatives for each of the Range Projects remained for environmental analysis. Although the Range Projects are somewhat independent of each other (with the exception of the MOUT facilities), their orientation around the impact area is not. Each of the proposed Range Project alternatives needs to fit within a range configuration so as to maximize safety and minimize conflicts with the use of other existing and proposed ranges. This EIS/EIR presents three proposed range configurations or scenarios where one of each of the Range Projects is grouped together to fit within the existing range configuration (Figures ES-3, ES-4, and ES-5). The Cantonment Projects and their alternatives are mutually exclusive and independent such that they are presented as individual project alternatives. A minimum of two alternate locations for the Cantonment Projects (in addition to No Action) were analyzed (Figure ES-6).

The alternatives for each of the Cantonment Projects are similar in size and scope, and vary in location only. In addition, UTES and the Fire Station include rehabilitation or construction of additions to the existing facilities as an alternative.



Source: James M. Montgomery, 1991

MMR ACTIVITIES

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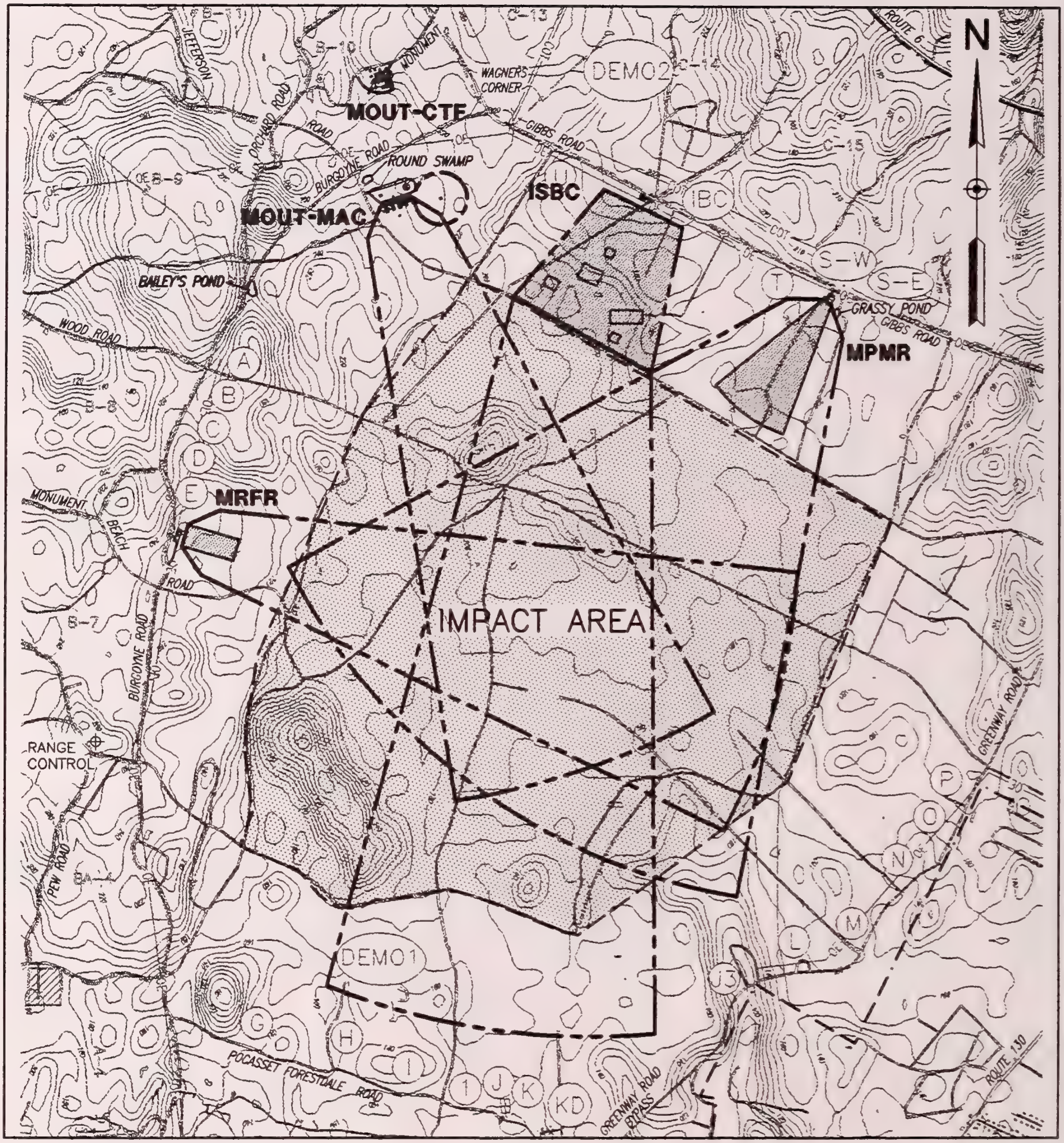
Figure ES-2



LEGEND

▨ PROPOSED RANGE AREA

— — — PROPOSED SURFACE DANGER ZONE LIMITS

— · — INSTALLATION BOUNDARY

Ⓐ EXISTING RANGE

① EXISTING MORTAR POSITION

▧ EXISTING AMMUNITION SUPPLY POINT (ASP)

A-4 EXISTING TRAINING AREA

—COT— EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION

—OE— EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

FIGURE DOES NOT INDICATE ALL GUN AND MORTAR POSITION LOCATIONS.

0 1500 3000 FEET

1"=3000'

Source: Camp Edwards Training Site

RANGE PROJECT SCENARIO 1

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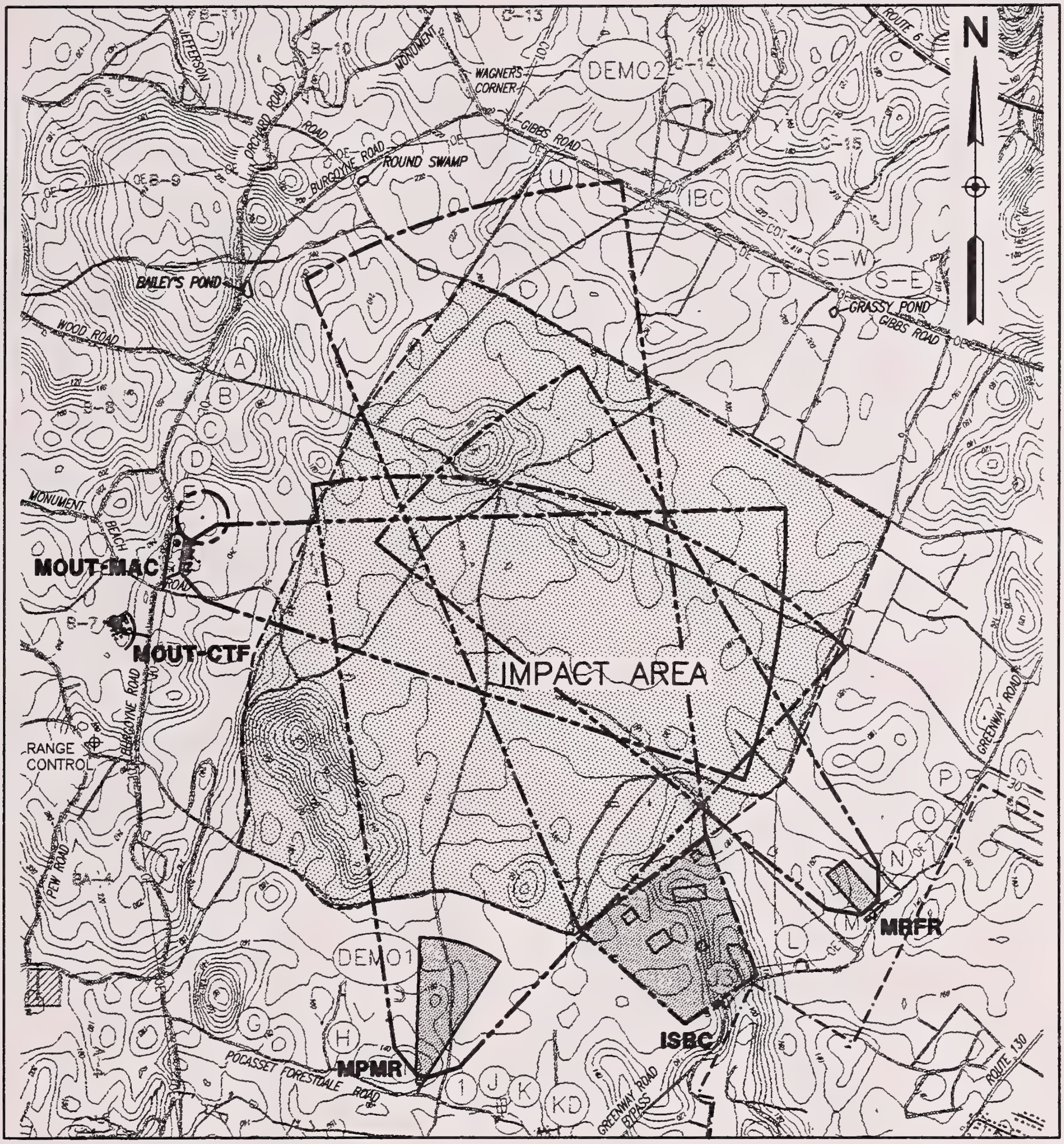
Figure ES-3



LEGEND

▨	PROPOSED RANGE AREA
— - - —	PROPOSED SURFACE DANGER ZONE LIMITS
— - — - —	INSTALLATION BOUNDARY
Ⓐ	EXISTING RANGE
①	EXISTING MORTAR POSITION
▨	EXISTING AMMUNITION SUPPLY POINT (ASP)
A-4	EXISTING TRAINING AREA
—— COT ——	EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION
—— OE ——	EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

FIGURE DOES NOT INDICATE ALL GUN AND MORTAR POSITION LOCATIONS.

0 1500 3000 FEET

1"=3000'

Source: Camp Edwards Training Site

RANGE PROJECT SCENARIO 2

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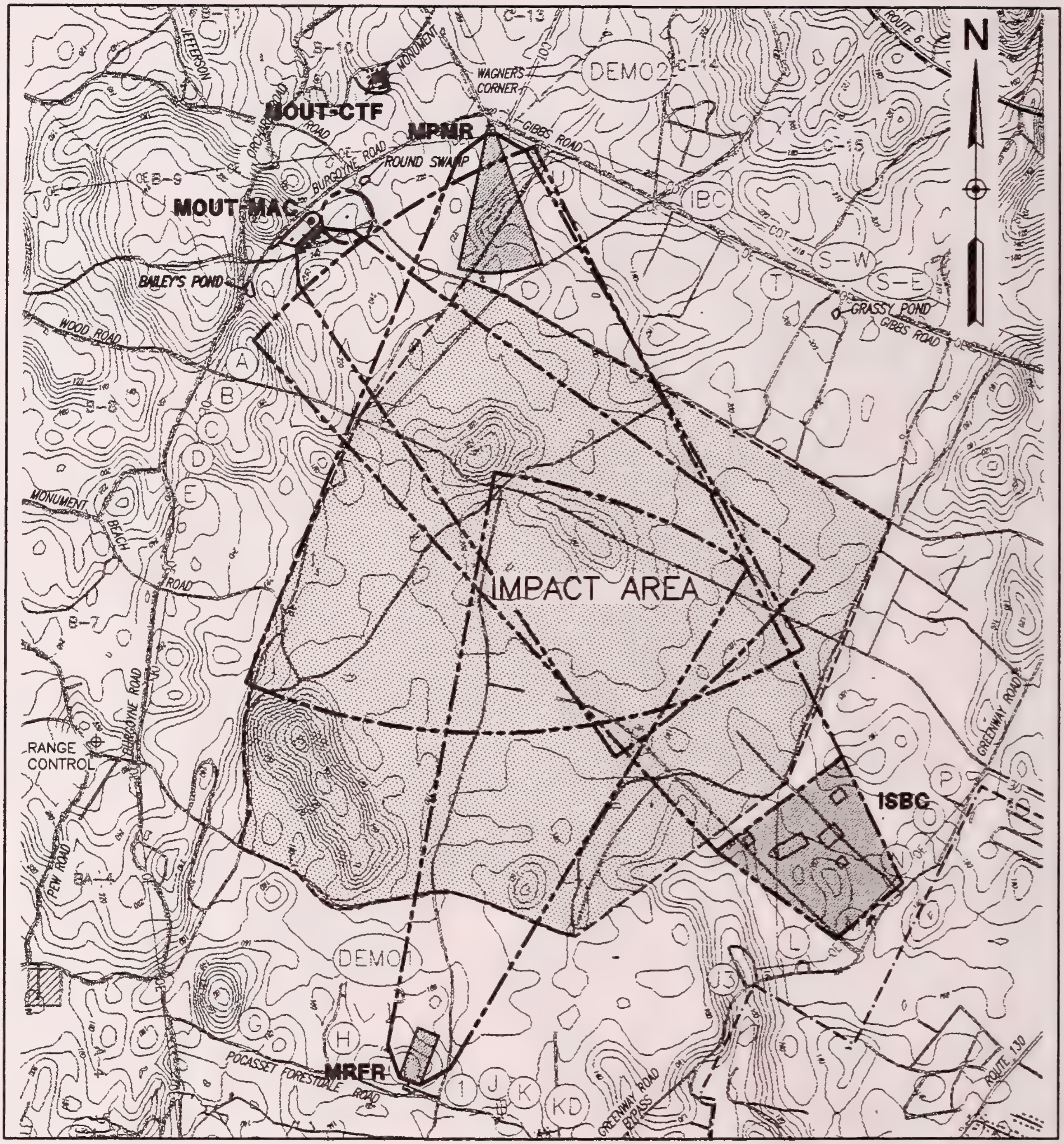
Figure ES-4



LEGEND

▨ PROPOSED RANGE AREA

— — — PROPOSED SURFACE DANGER ZONE LIMITS

— · — · — INSTALLATION BOUNDARY

Ⓐ EXISTING RANGE

① EXISTING MORTAR POSITION

▨ EXISTING AMMUNITION SUPPLY POINT (ASP)

A-4 EXISTING TRAINING AREA

—— COT —— EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION

—— OE —— EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

FIGURE DOES NOT INDICATE ALL GUN AND MORTAR POSITION LOCATIONS.

0 1500 3000 FEET

1"=3000'

Source: Camp Edwards Training Site

RANGE PROJECT SCENARIO 3

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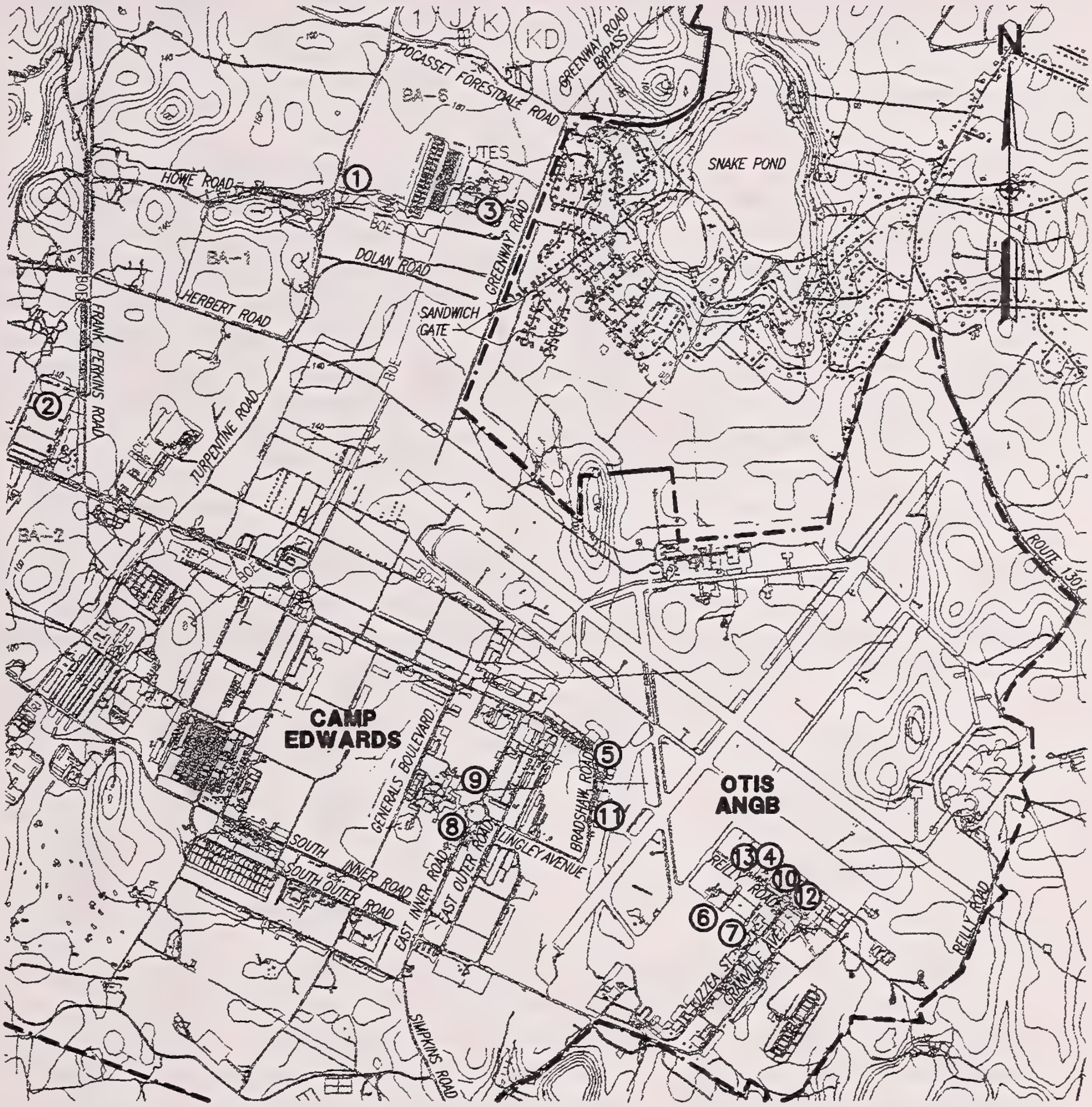
Figure ES-5



LEGEND

① UTES PROJECT ALTERNATIVE #1

② UTES PROJECT ALTERNATIVE #2

③ UTES PROJECT ALTERNATIVE #3

④ AIRFIELD CONTROL TOWER PROJECT ALTERNATIVE #1

⑤ AIRFIELD CONTROL TOWER PROJECT ALTERNATIVE #2

⑥ AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVE #1

⑦ AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVE #2

⑧ ENVIRONMENTAL FACILITY PROJECT ALTERNATIVE #1

⑨ ENVIRONMENTAL FACILITY PROJECT ALTERNATIVE #2

⑩ FIRE STATION PROJECT ALTERNATIVE #1

⑪ FIRE STATION PROJECT ALTERNATIVE #2

⑫ FIRE STATION PROJECT ALTERNATIVE #3

⑬ FIRE STATION PROJECT ALTERNATIVE #4

— · — INSTALLATION BOUNDARY

—— COT —— EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION

—— BOE —— EXISTING BASE OVERHEAD ELECTRIC DISTRIBUTION

0 1400 2800 FEET

1"=2800'

Source: Camp Edwards Training Site Otis ANGB

CANTONMENT PROJECT ALTERNATIVES

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Figure ES-6

ENVIRONMENTAL CONSEQUENCES

Potential impacts were evaluated by comparing the environmental effects associated with each proposed alternative to existing baseline conditions. Impacts to the following environmental resources were considered: air quality; noise; earth resources (soils and topography); water resources; biological resources; land use; cultural resources; hazardous materials and hazardous waste management; utilities; transportation; and socioeconomics. Impacts associated with each of the proposed projects are similar, with localized differences depending on alternative location. These impacts are summarized by resource below. Comparisons of Range Project alternative impact and Cantonment Project alternative impact are provided in Tables ES-1 and ES-2, respectively.

Air Quality

Impacts to air quality are expected to be the same regardless of alternative location. The following estimated net annual increase in criteria pollutant (pollutants for which the U.S. Environmental Protection Agency has set national ambient air quality standards) emissions are expected to result from operation of the 10 proposed projects:

• Volatile Organic Compounds	10,139 pounds (lbs)
• Nitrogen oxides	12,844 lbs
• Carbon monoxide	60,258 lbs
• Sulfur dioxide	4,412 lbs
• Particulate matter	2,729 lbs
• Lead	110 lbs

In addition to the emissions presented above, short-term increases of criteria pollutant emissions are expected during construction. With the exception of PM10, construction emissions are far below de minimis threshold levels established by 40 Code of Federal Regulations (CFR) 51.853(b). Construction-related PM10 emissions are estimated at approximately 121 tons. However, these emissions are worst-case because all 10 projects were assumed to be constructed simultaneously over a three-month period. It is unlikely all 10 projects will be constructed at the same time. Construction activities will most likely take place over several years. Spreading these emissions over several years will reduce PM emissions to well under de minimis threshold levels. In addition, PM10 emissions do not account for mitigating measures such as use of watering trucks, prohibiting construction during periods of high wind, and covering and stabilizing unused storage piles. These measures will significantly reduce PM10 emissions. Also, PM10 emissions were based on emission factors for total suspended particulates which result in conservatively high pollutant emissions because total suspended particulates include those particles greater than 10 μg in diameter. PM10 emissions include only those particulates with a diameter less than 10 μg.

Table ES-1
Comparison of Range Project Alternative Impacts by Scenario

Resource Issue	MRFR				MPMR				ISBC				MOUT-MAC				MOUT-CTF			
	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action
Air Quality																				
Increase in emissions from constriction activities.	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA
Increase in emissions from project activities.	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Noise																				
Increase in off-post noise from project activities.	N	○	N	NA	N	N	N	NA	N	N	○	NA	N	N	N	NA	N	N	N	NA
Earth Resources																				
Disturbance of soils during grading from range construction	○	*	*	NA	*	*	○	NA	*	*	*	NA	○	○	○	NA	○	○	○	NA
Potential accumulation of metals in soils.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	NA	NA	NA	NA	NA
Water Resources																				
Potential increase in surface water erosion and sedimentation during range construction.	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA
Potential for metals in soils to migrate to groundwater.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	NA	NA	NA	NA	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

[1] Land use compatibility issues are addressed under Noise.

Table ES-1 (continued)
Comparison of Range Project Alternative Impacts by Scenario

Resource Issue	MRFR				MPMR				ISBC				MOUT-MAC				MOUT-CTF			
	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action
Biological Resources																				
Loss of vegetation or habitat, or wildlife displacement.	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Loss of sensitive vegetation or habitat, or sensitive species displacement.	N	N	N	NA	*	*	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Impacts to wetland areas.	N	N	N	NA	○	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Land Use																				
Potential changes in on-post land uses.	*	N	N	NA	N	N	*	NA	N	N	N	NA	*	*	*	NA	*	*	*	NA
Adverse effects to off-post land uses[1]	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Cultural Resources																				
Loss of prehistoric resources.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	○	○	○	NA
Loss of historic resources.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	○	○	○	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

[1] Land use compatibility issues are addressed under Noise.

Table ES-1 (continued)
Comparison of Range Project Alternative Impacts by Scenario

Resource Issue	MRFR				MPMR				ISBC				MOUT-MAC				MOUT-CTF			
	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action
Hazardous Materials and Hazardous Waste Management																				
Increased hazardous waste generation from project activities.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Utilities																				
Increased utility demand	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Transportation																				
Project-related traffic increase.	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Socioeconomics																				
Short-term increase in local purchased goods and services during construction.	B	B	B	NA	B	B	B	NA	B	B	B	NA	B	B	B	NA	B	B	B	NA
Disproportionately high and adverse human health or environmental effects on minority and/or low-income communities.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA

Notes:

● = Significant impact/Not mitigatible
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* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

(1) Land use compatibility issues are addressed under Noise.

Table ES-2
Comparison of Cantonment Project Alternative Impact

Resource Issue	UTES				Airfield Control Tower			AGU			Fire Station					Environmental Facility		
	1	2	3	No Action	1	2	No Action	1	2	No Action	1	2	3	4	No Action	1	2	No Action
Air Quality																		
Increase in emissions from construction activities.	○	○	○	NA	○	○	NA	○	○	NA	○	○	○	○	NA	○	○	NA
Increase in emissions from project activities.	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Noise																		
Increase in off-post noise from project activities.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Earth Resources																		
Disturbance of soils from grading during construction.	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Water Resources																		
Increase in surface water runoff.	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Impacts to groundwater.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

(1) Land use compatibility issues are addressed under Noise.

Table ES-2 (continued)
Comparison of Cantonment Project Alternative Impact

Resource Issue	UTES				Airfield Control Tower			AGU			Fire Station					Environmental Facility		
	1	2	3	No Action	1	2	No Action	1	2	No Action	1	2	3	4	No Action	1	2	No Action
Biological Resources																		
Loss of vegetation or habitat, or wildlife displacement.	*	*	*	NA	*	N	NA	N	N	NA	N	N	N	*	NA	*	*	NA
Loss of sensitive vegetation or habitat, or sensitive species displacement.	*	N	*	NA	N	N	NA	N	N	NA	N	N	N	N	NA	○	○	NA
Impacts to wetland areas.	○	N	○	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Land Use																		
Potential changes in on-post land uses.	*	*	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	*	*	NA
Adverse effects to off-post land uses(1)	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Cultural Resources																		
Loss of prehistoric resources.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Loss of historic resources.	○	○	○	○	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Hazardous Materials and Hazardous Waste Management																		
Increased hazardous waste generation from project activities.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

(1) Land use compatibility issues are addressed under Noise

Table ES-2 (continued)
Comparison of Cantonment Project Alternative Impact

Resource Issue	UTES				Airfield Control Tower			AGU			Fire Station					Environmental Facility		
	1	2	3	No Action	1	2	No Action	1	2	No Action	1	2	3	4	No Action	1	2	No Action
Utilities																		
Increased utility demand	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Transportation																		
Project-related traffic increase.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Socioeconomics																		
Short-term increase in local purchased goods and services during construction.	B	B	B	NA	B	B	NA	B	B	NA	B	B	B	B	NA	B	B	NA
Disproportionately high and adverse human health or environmental effects on minority and/or low-income communities.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

[1] Land use compatibility issues are addressed under Noise

Total cumulative emissions (direct and indirect) are below de minimis threshold levels established by 40 Code of Federal Regulations (CFR) 51.853(b), and therefore these projects do not require a conformity determination. Best available control technology will be implemented during construction to minimize construction-related emissions.

Criteria pollutant emissions increases are not expected to result under No Action.

Noise

Under existing conditions, noise levels which are "incompatible" with residential development (zone III) extend off-post in the vicinity north of Snake Pond and east of Greenway Road (Figure ES-7). In addition, noise levels which are "normally incompatible" with residential development (zone II) extend off-post in the vicinity of Snake and Peter's Ponds, and west of Ranges N, O, and P.

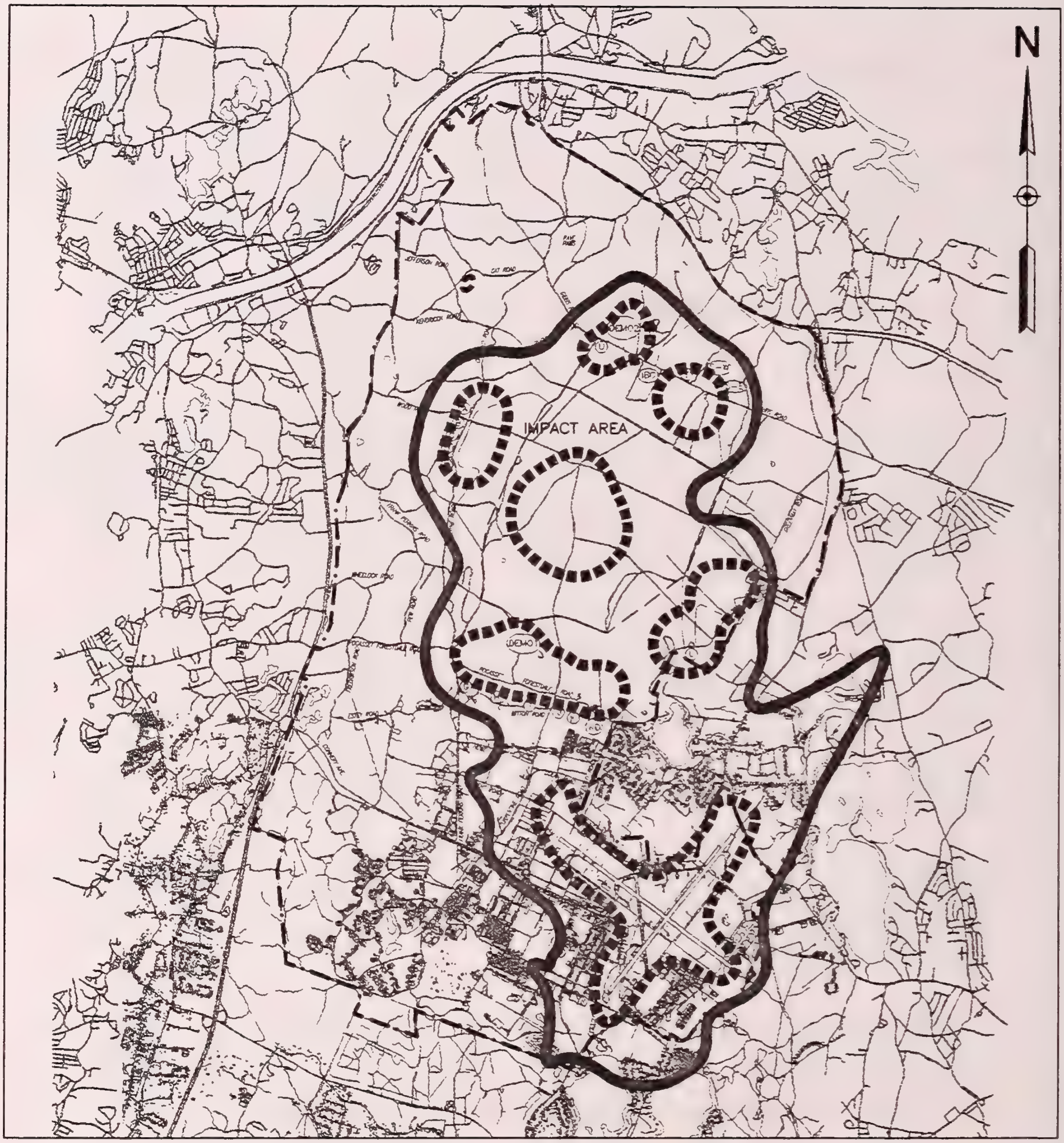
Project-related impacts to off-post noise levels are associated with the Range Projects. No noise impacts (other than during construction) are associated with the Cantonment Projects. Although total noise generating activities associated with the Range Projects are similar, there are differences between range scenarios in off-post noise levels.

Scenario 1. Off-post zone III and II noise levels are not expected to extend further beyond the MMR boundary as a result of Scenario 1 (Figure ES-8).

Scenario 2. A slight increase in the zone II and zone III noise areas (which extends off-post under baseline conditions) is expected to result from the construction and operation of the MRFR under Scenario 2 (Figure ES-9). This increase would occur in the vicinity of Snake Pond and Forestdale.

Scenario 3. A slight increase in the zone III area (which extends off-post under baseline conditions) is expected to result in the area east of N Range and the MMR boundary (Figure ES-10). In addition, similar to Scenario 2, a slight increase in the zone II area is also expected to result in the vicinity of Snake Pond and Forestdale.

Increases in off-post noise levels are not expected to result under No Action.



LEGEND

— · — — · — — INSTALLATION BOUNDARY

━━━━━━━━ NORMALLY INCOMPATIBLE WITH RESIDENTIAL USE

■■■■■■■■■■■■ INCOMPATIBLE WITH RESIDENTIAL USE

0 4000 8000 FEET

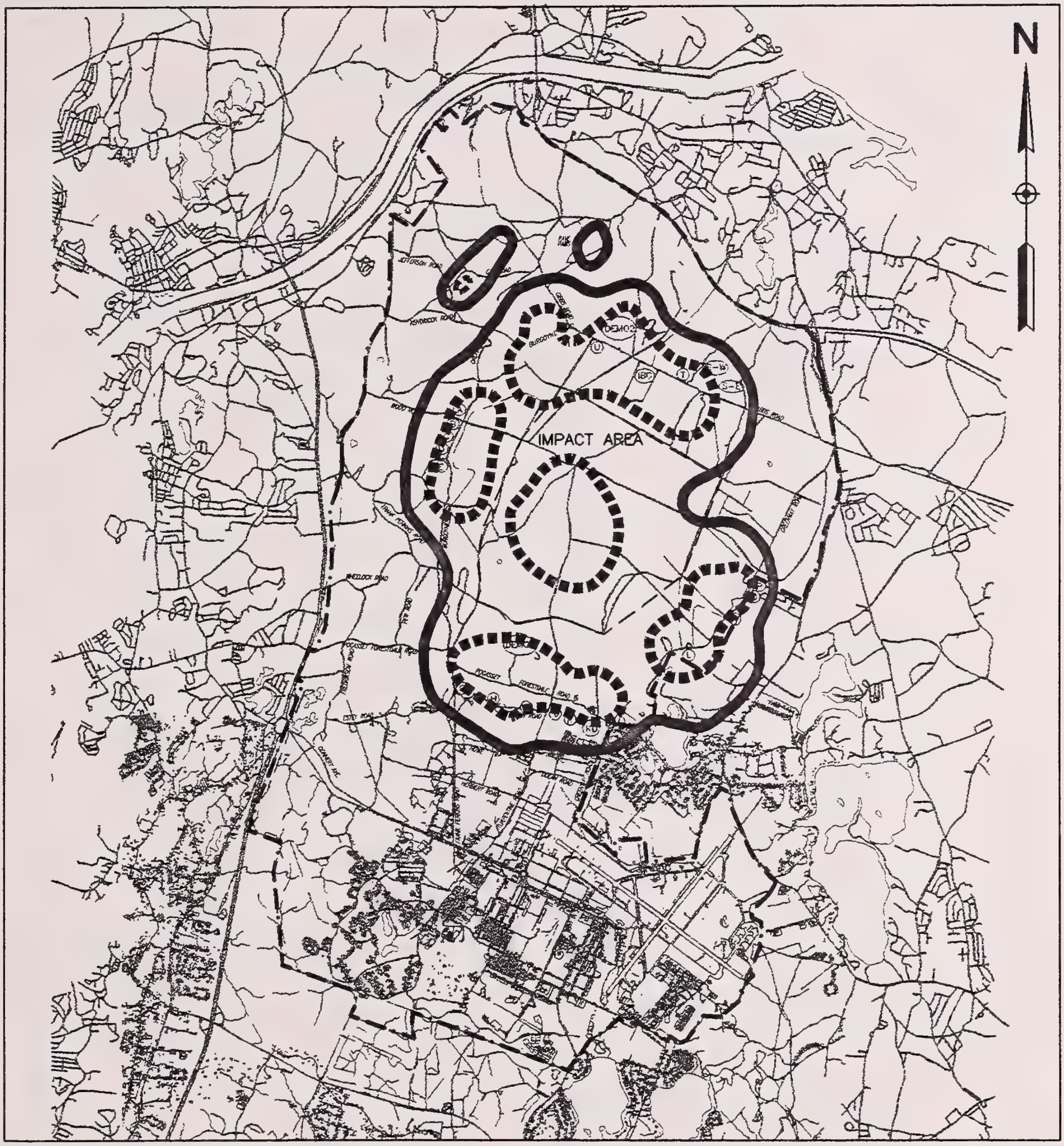
1"=8000'

Source: U.S. Army, 1996; MAANG, 1996

EXISTING COMBINED NOISE CONTOURS (FY 1994)

File Name: J:\6650-14\EX-SUM\6650F041.DWG

Figure ES-7



LEGEND

— · — · — INSTALLATION BOUNDARY
━━━━━━ NORMALLY INCOMPATIBLE WITH RESIDENTIAL USE
■■■■■■■■■■■ INCOMPATIBLE WITH RESIDENTIAL USE

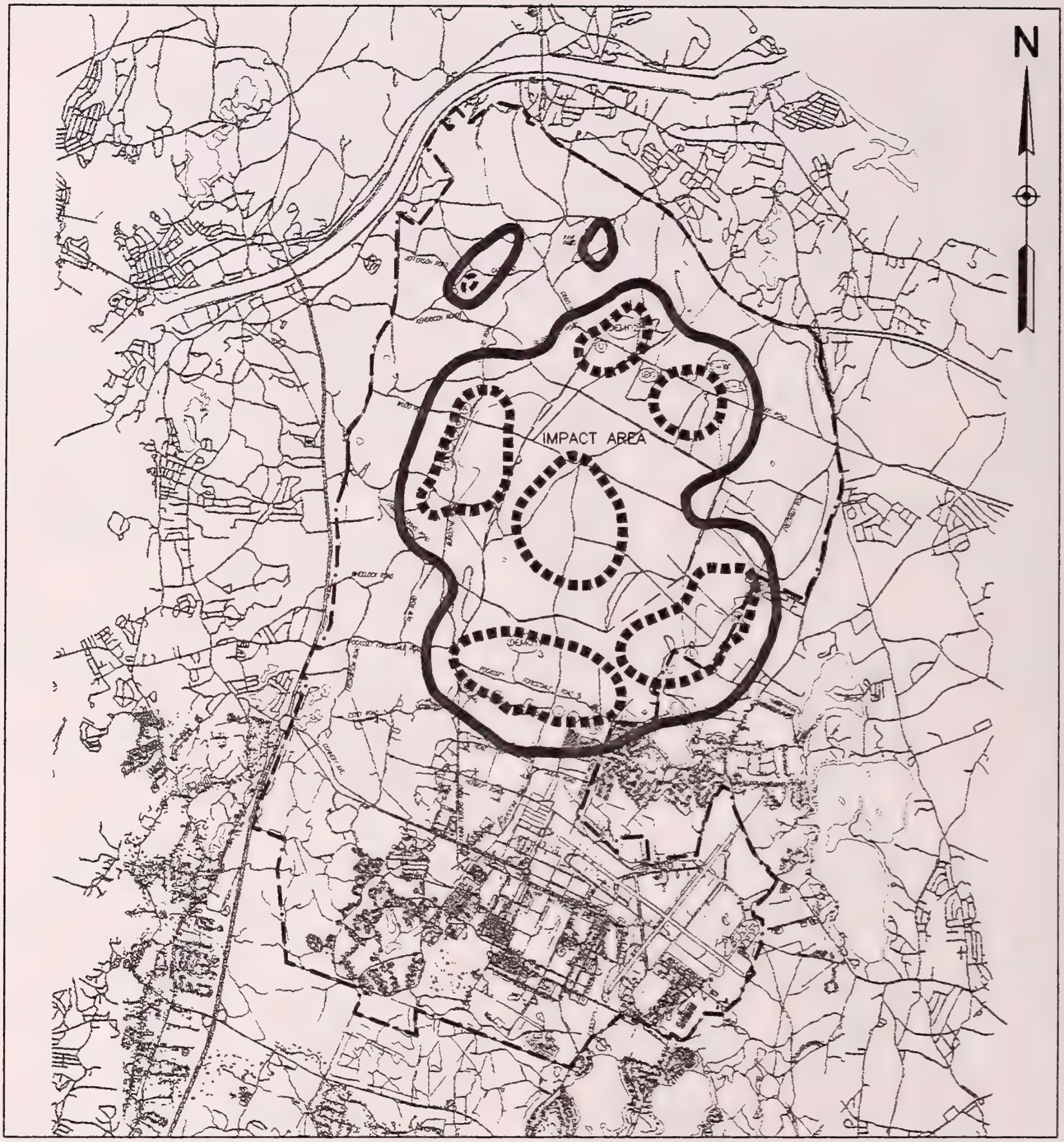
0 4000 8000 FEET
1"=8000'

Source: U.S. Army, 1996

PROJECTED NOISE CONTOURS
RANGE SCENARIO 1

File Name: J:\6650-14\EX-SUM\6650F046.DWG

Figure ES-8



LEGEND

—·—·—·— INSTALLATION BOUNDARY

▬▬▬▬ NORMALLY INCOMPATIBLE WITH RESIDENTIAL USE

■■■■■■ INCOMPATIBLE WITH RESIDENTIAL USE

0 4000 8000 FEET

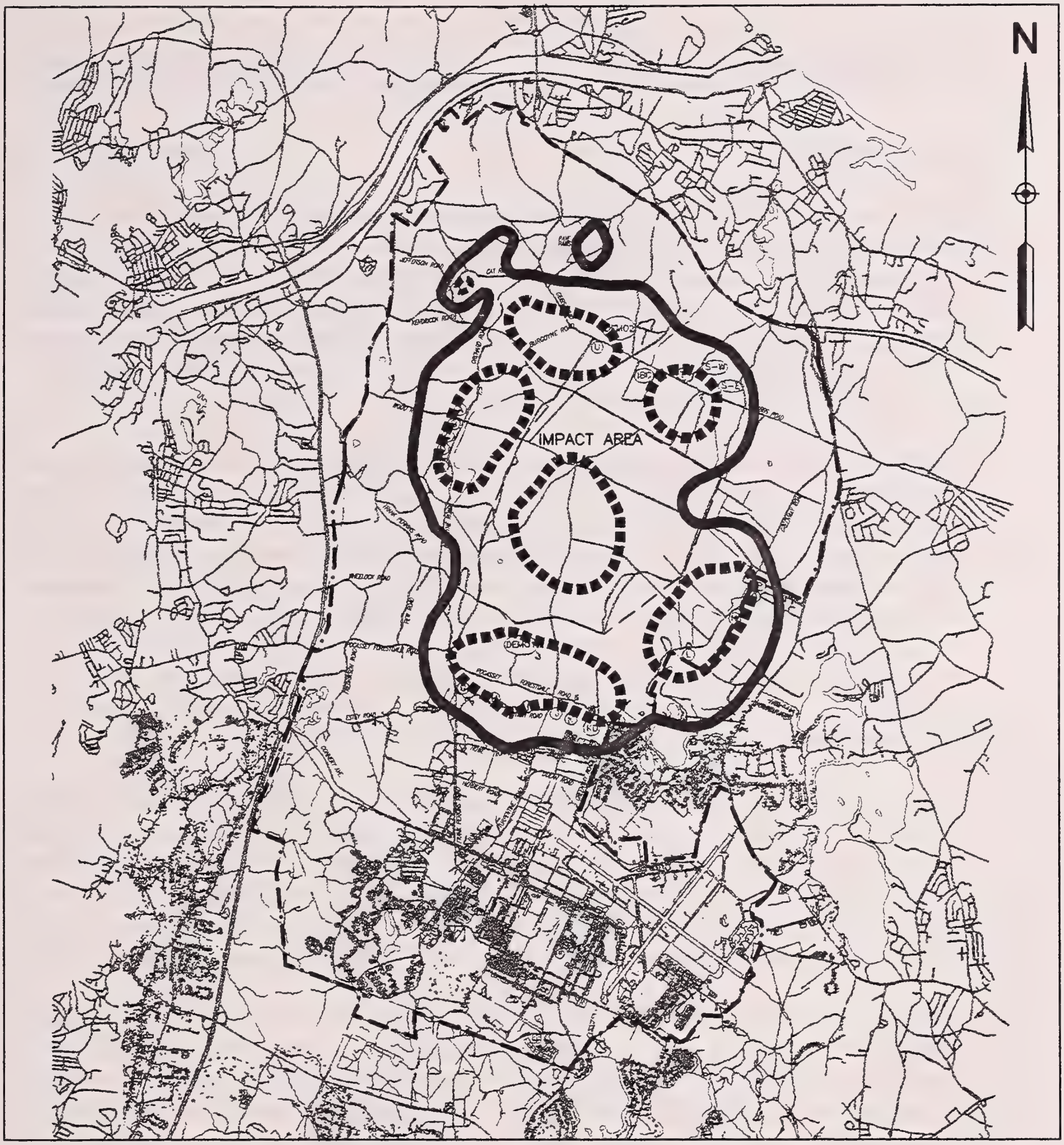
1"=8000'

Source: U.S. Army, 1996

PROJECTED NOISE CONTOURS
RANGE SCENARIO 2

File Name: J:\6650-14\EX-SUM\6650F046.DWG

Figure ES-9



LEGEND

— · — · — INSTALLATION BOUNDARY

▬▬▬▬▬ NORMALLY INCOMPATIBLE WITH RESIDENTIAL USE

■■■■■■■■■■■ INCOMPATIBLE WITH RESIDENTIAL USE

0 4000 8000 FEET

1" =8000'

Source: U.S. Army, 1996

PROJECTED NOISE CONTOURS
RANGE SCENARIO 3

File Name: J:\6650-14\EX-SUM\6650F046.DWG

Figure ES-10

Earth Resources

Impacts to earth resources (topography) are associated with the construction of the Range Projects. No impacts are expected to result from construction or operation of the Cantonment Projects. Some topographic alteration may be necessary to construct ranges in areas where ranges do not currently exist. However, in these instances, ranges would be designed to fit within the existing topographic setting as much as possible to maintain training realism. Those alternative locations that involve the conversion of existing ranges are not expected to require topographic alteration.

Soils impacts are associated with the potential for metals from bullets fired at the proposed ranges to accumulate in soils in and in front of target berms. However, range design can incorporate bullet traps, clay liners under berms, and/or soil additives to prevent migration of metals in these soils. Under No Action, metals exist in surface and subsurface soils from past weapons firing. MAARNG will evaluate potential treatment technologies to address metals in existing firing range soils.

Impacts to earth resources are not expected to result under No Action.

Water Resources

No impacts to surface water are expected to result from construction or operation of the proposed projects. Proposed access roads and parking areas for the Range Projects will be constructed of either dirt or crushed stone rather than impervious material to minimize surface water runoff. The Cantonment Projects will include both pervious and impervious access roads and parking areas. Stormwater runoff associated with construction and operation of the proposed projects will be addressed within the project design.

Project-related impacts to groundwater are not expected to result from the construction or operation of the proposed projects because mitigating measures such as bullet traps or soil additives (to chemically fixate metals) will be implemented in the project design. However, under all alternatives including No Action, the potential exists for metals in soils from past weapons firing to migrate into the water table. Studies were conducted at Camp Edwards to determine this long-term potential impact. These studies indicate vertical migration of these metals is occurring at a rate of approximately 2 to 3 inches per year. Subsequent studies are ongoing to determine what effect, if any, vertical migration of metals may have on the aquifer underlying the Camp Edwards impact area. Study results will be incorporated into the Final EIS/EIR. In addition, information will be provided to the public through informational forums and fact sheets as study results become available. The Long Range Water Supply Process Action Team will be involved in the development and implementation of the impact area study.

Biological Resources

Project-related impacts to biological resources include the loss of vegetation and habitat, potential impacts to wetlands, and potential impacts to state-listed threatened or endangered species. The amount and type of vegetation and habitat loss or alteration is expected to be minimal and will not differ significantly between the Range Project scenarios or Cantonment Project alternatives.

Grassy Pond may potentially be impacted during construction of the MPMR under Scenario 1; however, adherence to a 100-foot buffer zone around the wetland area, and use of silt fencing or hay bales during construction will mitigate these potential impacts. Less than 0.5 acre of potential upland sandpiper (state endangered) and grasshopper sparrow (state threatened) habitat would be cleared for construction of the Environmental Facility (under either alternative). Surveys will be conducted during the nesting season to ensure the proposed locations are not used as nesting areas for the upland sandpiper and grasshopper sparrow. In addition, offsets for the habitat potentially lost by construction of the buildings as well as the potentially diminished habitat value of the surrounding area to the upland sandpiper will be implemented in accordance with Massachusetts Division of Fish and Wildlife recommendations. No other impacts to wetland resources, or threatened or endangered species or habitat are expected.

Impacts to biological resources are not expected to result under No Action.

Land Use

No land use impacts are expected to result from the construction or operation of the proposed projects. Land use impacts are not expected to result under No Action.

Cultural Resources

Cultural resources are not expected to be impacted by the construction and operation of the Range Projects, with the exception of the proposed MOUT-CTF. Land with a high potential to contain archeological resources would be impacted during construction and operation of the MOUT-CTF (under all scenarios). Under Scenario 1 and 3, MOUT-CTF would be constructed adjacent to a known prehistoric site. While the site is known, the boundaries of the archeological deposition are not. A site examination (Phase II) is currently being conducted to determine site boundaries. Under Scenario 2, MOUT-CTF would be constructed near several find spots where low densities of prehistoric cultural material were found. An intensive (locational) survey is currently being conducted to determine if archeological sites may exist. Results of this study will be incorporated into the Final EIS/EIR.

If NGB and MAARNG determine archeological sites within MOUT-CTF alternative locations meet National Register of Historic Places criteria of eligibility, they will consult with the Massachusetts Historical Commission (MHC) to determine what effect the proposed action may have on these resources, in compliance with Section 106 of the National Historic Preservation Act. If it is determined that the proposed action will have an adverse effect, NGB and MAARNG will consult with the MHC, other interested persons, and, if necessary, the Advisory Council on Historic Preservation, to seek agreement on alternatives to eliminate or reduce the adverse effect. The review process may result in a Memorandum of Agreement or Programmatic Agreement among the consulting parties that outlines stipulations to eliminate, minimize, or mitigate any adverse project impacts.

Cultural resources are not expected to be impacted by the construction and operation of the Cantonment Projects, with the exception of the UTES facility. The existing UTES is located within the former Boeing Michigan Aeronautical Research Center (BOMARC) missile complex. The potential exists for the BOMARC complex to be impacted by the UTES facility under all alternatives, including No Action. A Cold War-era historic properties context for the U.S. Army is currently being developed. Once completed, the Army will use the context to appropriately evaluate this site as a component of a nationwide military context.

With the exception of UTES (discussed above), impacts to cultural resources are not expected under No Action.

Hazardous Materials and Hazardous Waste Management

Impacts to hazardous materials and hazardous waste management are not expected to result from construction or operation of the Range or Cantonment Projects, or under No Action.

Utilities

The Range and Cantonment projects will not result in a significant increase in demand for utility services, because the proposed projects are not expected to result in an increase of personnel. There will be a slight increase in electrical demand due to the addition of computerized targetry for the Range Projects. In addition, there will be a short-term increase in construction debris during facility construction/demolition activities.

Utility impacts are not expected to result under No Action.

Transportation

Based on the historic peak month of Camp Edwards utilization (June), a maximum of 50 additional convoy and privately owned vehicles (combined) will be generated by the Range Projects in the peak hour on Saturday morning. During Friday evening, a maximum of 76 additional convoy and privately owned vehicles (combined) in the peak hour would result. These minor increases are projected to be the same regardless of alternative location and would not occur during the Friday evening or Saturday midday peak hours of demand for the MMR study area. Therefore, these projected increases are not expected to impact the critical demand period. No increase in traffic is expected to result from the Cantonment Projects.

Transportation impacts are not expected to result under No Action.

Socioeconomics

No project-related socioeconomic impacts are expected to result from operation of the Range and Cantonment projects. A short-term increase of purchased goods and services would result during construction. In addition, no impacts to minority or low-income communities are expected to result from construction or operation of the Range and Cantonment Projects.

Socioeconomic impacts are not expected to result under No Action. There would be no short-term increase in the purchasing of goods and services as construction would not occur.

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SECRETARIAL DECISIONS
MASSACHUSETTS EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
(EOEA) NO. 5834

Enclosed herein are copies of the following Massachusetts Environmental Policy Act (MEPA) Certificates, as amended, which outline, in part, the scope of this Environmental Impact Report (EIR) regarding the proposed facilities upgrade:

- Letter on Extension of Filing Deadline dated October 25, 1995
- Certificate on the Notice of Project Change (NPC) dated December 8, 1994
- Certificate on the Notice of Project Change (NPC) dated March 18, 1993
- Certificate on the Environmental Notification Form (ENF) dated February 10, 1986

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The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, 02202

WILLIAM F. WELD
GOVERNOR
ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR
TRUDY COXE
SECRETARY

Tel: (617) 727-9800
Fax: (617) 727-2754

REC'D
OCT 31 1995
TAG

October 25, 1995

Major General Raymond A. Vezina
Camp Curtis Guild
Haverhill Street
Reading, MA 01867-1999

Re: Extension of Filing Deadline: MMR Master Plan EIR
EOEA# 5834

Dear General Vezina:

I have reviewed your letter requesting a one year extension of the 40 week filing schedule for the Draft EIR for the above referenced project. My December 8, 1994 Certificate allowed you to make a written request for an extension of the deadline, "... where cause can be shown, as is customary with filing deadlines under MEPA."

Although I am disappointed that such a delay is required, I understand that the time involved in development of study protocols for studies that have not been done previously, certain delays in release of funding and other contractual arrangements, seasonality of some of the studies, and anticipated delays in gaining approval to file the DEIR/EIS through the Department of the Army constitute cause within the meaning of the Certificate. I hereby grant the extension of 12 months for the filing of the DEIR. I encourage you, however, to develop and file the DEIR as soon as is possible, hopefully prior to the new deadline.

In addition, I suggest that you contact Dick Foster of my staff at your convenience regarding establishment of the proposed Community Working Group. He can be reached at 617-727-5830; Extension 305.

Cordially,

Trudy Coxe

Trudy Coxe

TC/rf

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, 02202

WILLIAM F. WELD
GOVERNOR
ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR
TRUDY COXE
SECRETARY

Tel: (617) 727-9800
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CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE NOTICE OF PROJECT CHANGE

PROJECT NAME : Massachusetts Military Reservation Master Plan
PROJECT LOCATION : Bourne, Falmouth, Mashpee, Sandwich
EOEA NUMBER : 5834
PROJECT PROPONENT : Mass. Army National Guard
DATE NOTICED IN MONITOR : October 24, 1994

Pursuant to the Massachusetts Environmental Policy Act (G.L., c.30, s.61-62H) and Section 11.17 of the MEPA regulations (301 CMR 11.00), I have reviewed the Notice of Project Change submitted on the above project and hereby determine that it **requires** the preparation of an Environmental Impact Report.

This master planning project was originally filed with MEPA in January of 1986 and at that time the plan contained 58 separate projects. A Certificate was issued on February 10, 1986 requiring the preparation of an Environmental Impact Report (EIR). The required EIR was never filed.

Subsequently, a Notice of Project Change (NPC) was filed in December of 1992 that reduced the number of projects to 17. A Certificate was issued on that NPC on March 18, 1993 requiring the preparation of an Environmental Impact Report and refocusing the scope to reflect the change in the project.

The reduction in scope of the plan at that time was the result of two factors: (1) some project elements were allowed to proceed without further MEPA review by the February 10, 1986 Certificate (and have now been completed) and (2) others had been eliminated due to changes in training requirements.

The current NPC describes a project that includes 10 elements; 6 Army Guard project and 4 Air Guard projects. After consideration of the comments received on the prior NPC and after obtaining agreement and funding from the National Guard Bureau, the proponent has requested a rescoping for purposes of incorporating the Air Guard projects in the EIR and focusing the EIR on the proposed project elements as well as the cumulative effects of all activities on the base. It is my opinion that a crisply focused and carefully prepared EIR remains the most effective means of addressing these issues.

The EIR will thus serve not only as an assessment of the potential environmental impacts of implementation of the master plan but also as a vehicle for analyzing these potential impacts in the broader context of all activities on the base. It has been frequently argued by neighbors of the base and environmental advocacy groups that the EIR should provide an assessment and analysis of the cumulative effects of the plan on the full extent of activities on the base and on the environmental consequences of those activities. I agree and I expect that this broader analysis will be provided in the EIR. I do not expect, however, that the EIR will resolve the issue of apparently elevated cancer rates on the Upper Cape or whether the base is implicated in this matter as some commentors suggest. I note, however, that the Agency for Toxic Substances Disease Register is doing a health assessment around the base and that the Massachusetts Department of Public Health has given a $1.2 million grant to the Silent Spring Institute to conduct a study of cancer rates in the towns around the base. The EIR should report the sources of contaminants on the base, the nature and concentration of those contaminants, and the direction of movement of those contaminants. This information should be useful to other agencies investigating cancer rates and their causes.

The MAARNG has not been idle during the interval between the 1986 Certificate and the current Notice of Project Change. The studies required for the Installation Restoration Program (IRP) have been completed and implementation has begun; archaeological surveys have been completed and the MAARNG has instituted a cultural resources management plan; rare plant and animal species surveys have been completed and recommendations of Massachusetts Natural Heritage Program (MNHP) have been adopted; the MAARNG has undertaken to study the air quality implications of propellent bag burning on the base and the studies should be complete at this writing; demolition of dilapidated structures and rehabilitation of other structures has begun; conversions to natural gas fuels for space heating have been completed; removal of underground storage tanks is underway; and studies have been conducted to determine the noise impacts of base activities on the local community. This information and analysis, coupled with the information required by this scope, should provide the basis for a thorough and comprehensive EIR.

The proponent has agreed to file the Draft EIR within 40 weeks of the issuance of this Certificate. This timetable, although not as short as some would like, will allow for careful and thorough analysis as well as internal review of the document in Washington. I will entertain written requests for an extension of this timetable where cause can be shown, as is customary with filing deadlines under MEPA.

The proponent has also requested that I assist in establishing a Community Working Group (CWG), the details of which will be developed in the near future. I agree that such a group might be useful in development and review of the environmental documents and I will commit my staff to assist in the establishment and organization of such a group.

I further believe that everyone would benefit from annual updates on projects, planning, remediation and other activities on the base following the completion of the EIR. These updates need not be formalized under the MEPA process but should be provided to MEPA, the Community Working Group, the communities involved, and to other interested parties.

The required EIR shall follow the outline contained at 301 CMR 11.07, shall address the issues raised in the attached comments, and shall address the following specific issues.

BACKGROUND DESCRIPTION

The EIR shall contain a history of past projects on the base and a complete description of the base and all activities that occur on the base whether conducted on the Massachusetts Military Reservation, Otis Air Force Base, or the Coast Guard Station. The EIR should provide information on person-day use of the base, broken down by state or federal entity, by week end and week day for typical days in February, May, August, and October. The study should then describe typical operations on the base during such times so as to allow a complete understanding of aircraft operations, light and heavy arms activity, and other activities with potential bearing on noise, air quality and groundwater.

The background section should also provide clear plans and maps of the base and the facilities and should include an detailed inventory of resource areas located on the base.

This section should provide the reader with a clear understanding of the intensity of use of the base and the aggregate military activities occurring on the base. This shall constitute the baseline against which the potential impacts of the master plan activities will be measured.

REVISED MASTER PLAN DESCRIPTION

The Revised Master Plan consists of 10 elements divided into 4 Air Guard projects and 6 Army Guard projects. The EIR shall describe each element in terms of location, mission or function, construction and operation requirements, and frequency and intensity of use.

This section should provide a clear description of any changes from similar elements identified in the 1985 Master Plan and from what currently exists at the base.

NOISE

The Army Environmental Hygiene Agency has conducted several noise studies on the base including development of Installation Compatible Use Zone contours for noise from base activities. The EIR should contain the results of these studies and evaluate them in terms of the requirements of the 1986 scope and this Certificate.

The EIR shall discuss the criteria used for evaluating the noise environment at the base. The base is unique in that the noise environment is punctuated by high-intensity short-duration noise (artillery, small arms, machine guns), machinery noise (trucks, tanks, etc.), and aircraft noise that in some cases occur together.

The EIR shall identify what means are available to minimize noise impacts from the base, which of these means are incorporated into the design of the new master plan, and what the overall effect of this mitigation is on the adjacent properties.

AIR QUALITY

The EIR shall identify all sources of air contaminants attributable to operation of the base, including propellent burning but not including the controlled burn program which is the subject of prior MEPA review.

The EIR shall then analyze the cumulative effect of these sources, insofar as their emissions might occur together, and assess the effects of these contaminants on downwind receptors using the prevailing wind direction during the time of occurrence.

WATER QUALITY

The base is a known source of contaminated groundwater. The DEP and the United States Environmental Protection Agency are currently concluding assessment activities on the site and, simultaneously, undertaking remedial actions such as capping the existing landfill, installing groundwater containment and remediation systems, and performing contaminated soil remediation. Additionally, these agencies have established a public participation process that includes several Process Action Teams to oversee and advise on the clean-up activities. The EIR shall summarize the assessment, containment, and remediation efforts that have been, or are being, planned and implemented on the base. This section should consider multi-media and cumulative effects in dealing with ground water contamination on the base.

The EIR will also report on the extent of contamination in the central Impact Area caused by exploded and unexploded ordinance and small arms fire and describe a clean-up protocol if required. The EIR should also present a monitoring scheme to ensure groundwater protection in the future.

There are several Zone IIs for public wells that extend onto the base. The EIR should present a policy for protection of these resources in relation to current and future activities on the base.

DISTRIBUTION

The EIR shall be distributed according to 301 CMR 11.24 and, in addition, shall be distributed to the Selectmen, Planning Boards, and Water Departments of Bourne, Falmouth, Mashpee and Sandwich, and to all parties that filed comments on the Notice of Project Change. In addition, four copies each shall be placed in the public libraries of the four communities.

Undersecretary

December 8, 1994
DATE

Trudy Coxe, Secretary

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, 02202

WILLIAM F. WELD
GOVERNOR

ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR

SUSAN F. TIERNEY
SECRETARY

(617) 727-9800

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE NOTICE OF PROJECT CHANGE

PROJECT NAME : Camp Edwards Master Plan
PROJECT LOCATION : Bourne, Falmouth, Mashpee, Sandwich
EOEA NUMBER : 5834
PROJECT PROPONENT : Mass. Army National Guard
DATE NOTICED IN MONITOR : December 22, 1992

Pursuant to the Massachusetts Environmental Policy Act (G.L., c.30, s.61-62H) and Section 11.17 of the MEPA regulations (301 CMR 11.00), I have reviewed the Notice of Project Change submitted on the above project and hereby determine that it **requires** the preparation of an Environmental Impact Report.

This master planning project was originally filed with MEPA in January of 1986 and at that time the plan contained 58 separate projects. The current plan has reduced that number to 17 separate projects.

The reduction in scope of the plan is the result of two factors: (1) some project elements were allowed to proceed without further MEPA review by the February 10, 1986 Certificate and have been completed and (2) others have been eliminated due to changes in training requirements.

Despite the significant reduction in the scope of the plan, the concerns which caused then-Secretary James Hoyte to require an Environmental Impact Report (EIR) are still inherent in the project, although perhaps to a somewhat lesser degree. As a result, a crisply focused and carefully prepared EIR remains the most effective means of addressing these concerns.

The EIR will serve as not only an assessment of the potential environmental impacts of implementation of the plan but will also serve as a vehicle for analyzing these potential impacts against the broader context of all activities on the base. It has been frequently argued by neighbors of the base and

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environmental advocacy groups that the EIR should provide an assessment and analysis of the cumulative effects of the plan on the full extent of activities on the base. I agree and I expect that this broader analysis will be provided in the EIR. I do not expect, however, that the EIR will resolve the issue of apparent elevated cancer rates on the Upper Cape or whether the base is implicated in this matter as some commentors suggest. However, the EIR will report the sources of contaminants on the base, the nature and concentration of those contaminants, and the direction of movement of those contaminants. This information should be useful to the State agencies investigating cancer rates and their causes.

The MAARNG has not been idle during the interval between the 1986 Certificate and the current Notice of Project Change. The studies required for the Installation Restoration Program (IRP) have been completed and implementation begun, archaeological surveys have been completed and the MAARNG has instituted a cultural resources management plan, rare plant and animal species surveys have been completed and recommendations of MNHP have been adopted, the MAARNG has undertaken to study the air quality implications of propellent bag burning on the base and the studies should be complete at this writing, demolition of dilapidated structures and rehabilitation of other structures has begun, conversions to natural gas fuels for space heating have been completed, removal of underground storage tanks is underway, and studies have been conducted to determine the noise impacts of base activities on the local community. This information and analysis coupled with the information required by this scope should provide the basis for a thorough and comprehensive EIR.

The required EIR shall follow the outline contained at 301 CMR 11.07 and shall address the following specific issues.

BACKGROUND DESCRIPTION

The EIR shall contain a complete description of the base and all activities that occur on the base whether conducted on the Massachusetts Military Reservation, Otis AFB, or the Coast Guard Station. The EIR should provide information on person-day use of the base, broken down by state or federal entity, by week end and week day for typical days in February, May, August, and October. The study should then describe typical operations on the base during such times sufficient to provide a complete understanding of aircraft operations, light and heavy arms activity, and other activities with potential bearing on noise, air quality and groundwater

This section should provide the reader with a clear understanding of the intensity of use of the base and the aggregate military activities occurring on the base. This shall constitute the baseline against which the potential impacts of the master plan activities will be measured.

REVISED MASTER PLAN DESCRIPTION

The Revised Master Plan consists of 17 elements divided into 4 categories: Cantonment Area Support Facilities (5), Cantonment Area Training Facilities (4), Training Area Support Facilities (1), and Training Area Range Facilities (7). The EIR shall describe each element in terms of location, function, construction and operation requirements, and frequency and intensity of use.

This section should provide a clear description of any changes from similar elements identified in the 1985 Master Plan and from what currently exists at the base.

NOISE

The Army Environmental Hygiene Agency has conducted several noise studies on the base including development of Installation Compatible Use Zone contours for noise from base activities. The EIR should contain the results of these studies. They will be evaluated in terms of the requirements of the 1986 scope and this Certificate.

The EIR shall discuss the criteria used for evaluating the noise environment at the base. The base is unique in that the noise environment is punctuated by high-intensity short-duration noise (artillery, small arms, machine guns), machinery noise (trucks, tanks, etc.), and aircraft noise that in some cases occur together.

The EIR shall identify what means are available to minimize noise impacts from the base, which of these means are incorporated into design of the new master plan, and what the overall effect of this mitigation is on the adjacent properties.

AIR QUALITY

The EIR shall identify all sources of air contaminants attributable to operation of the base, including propellent burning but not including the controlled burn program which is the subject of prior MEPA review.

The EIR shall then analyze the cumulative effect of these sources, insofar as their emissions might occur together, and assess the effects of these contaminants on downwind receptors using the prevailing wind direction during the time of occurrence.

WATER QUALITY

The base is a known source of contaminated groundwater. The EIR shall report on the results of the IRP and identify the extent and nature of existing contamination.

The EIR shall present remedial action plans, some of which have been or are being completed, for contaminated sites and shall present any corrective or compensatory plans for plumes already moving in groundwater.

DISTRIBUTION

The EIR shall be distributed according to 301 CMR 11.24 and, in addition, shall be distributed to the Selectmen, Planning Boards, and Water Departments of Bourne, Falmouth, Mashpee and Sandwich, and to all parties that filed comments on the Notice of Project Change. In addition, four copies each shall be placed in the public libraries of the four communities.

March 18, 1993
DATE

Acting Secretary
for Susan F. Tierney, Secretary

Comments received :

Abbott, Jayne
Alliance for Base Cleanup (1-4-93)
Alliance for Base Cleanup (2-18-93)
Association for the Preservation of Cape Cod (1-4-93)
Association for the Preservation of Cape Cod (2-17-93)
Barnstable County Assembly of Delegates
Barnstable County Commissioners

Cape Cod Commission (12-23-92)
Cape Cod Commission (2-25-93)
Childs, Peter
Coonamesset Pond Association
Dahmen, Charles and Doris
Department of Environmental Management
Johnson, Charles and Joyce
Magenau, William
Martin, Esther
Massachusetts Historical Commission
Massachusetts Highway Department
Massachusetts Building Trades Council
Mayhew, Joan
Provincetown Board of Health
Responsible Environmental Protection for Sandwich
Senator Kerry
Senators Murray and Rauschenbach and Representative Cahir
Sierra Club - Cape Cod Group
Singer, Robin and Tor Clark

SFT/rf

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street
Boston, Massachusetts 02202

MICHAEL S. DUKAKIS
GOVERNOR

JAMES S. HOYTE
SECRETARY

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS
ON THE
ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME : MARN 6 Master Plan Camp Edwards

PROJECT LOCATION : Bourne, Falmouth, Mashpee, Sandwich

EOEA NUMBER : 5834

PROJECT PROPONENT : Massachusetts Army Reserve National Guard

DATE NOTICED IN MONITOR : January 10, 1986

Pursuant to the Massachusetts Environmental Policy Act (G.L.,c.30,s.62-62H) and Sections 10.04(1) and 10.04(9) of the regulations implementing MEPA (301 CMR 10.00), and further, pursuant to the provisions of 33 U.S. Code 1323(a), I hereby determine that the above project requires the preparation of an Environmental Impact Report.

This is a striking example of a situation where both federal and state policy interests, as well as the rights of localities and citizens, will be served by strictly focused and precisely implemented environmental review. At present, abutters of Camp Edwards are beset with concerns arising from environmental conditions on the base. Base management must contend daily with problems created by those concerns, and rapid population growth in the region points to a steady increase in intensity of those concerns, with a commensurate increase in military time expended to deal with them. Camp Edwards occupies a critical position atop a major lens of the sole-source aquifer which provides the only drinking water for the Cape, a very rapidly expanding area of the Commonwealth's population and economy. Finally, legitimate national defense interests are damaged by the strife which arises when environmental concerns are not thoroughly and responsively dealt with.

I have reviewed the January, 1984 Master Plan, the June, 1985 Environmental Assessment, and all public comments filed on the latter document, as well as the Environmental Notification Form and comments filed thereon. In addition, my office conducted a public meeting in Sandwich on February 3, 1986, in addition to a thorough tour of Camp Edwards. Based on such review, I have determined that the project requires additional review through an Environmental Impact Report.

As will be noted in the Scope which follows, an EIR prepared pursuant to MEPA will differ in important respects from the environmental documentation prepared by MAARNG to date. It is apparent that the Environmental Assessment was carefully done and represents a significant expenditure of effort by MAARNG personnel. In many respects, it has been useful in describing the basic elements of the project. What it has not done, however, is to set forth the broader environmental baseline of all activities on Camp Edwards/Otis, so that the project may be viewed against the broader environment in which it takes place. Because of the absence of a Scoping procedure, the E.A. was not able to focus in on the activities most in need of critical analysis and public discussion. Because the E.A. was an assessment document, it was unable to fulfil the planning role of an EIR, in assessing how future impacts may be minimized or avoided in implementation of the project. Finally, much of the quantitative analysis which is being prepared (the extended IRP, the EMAP, the propellant study) had not been done in time for the E.A., and hence could only be promised, not reported.

MAARNG officials have been most cooperative during the scoping of this project, in explaining their activities, goals and needs. Because of the press of time, I have not been able to have the same close communication with officials of the National Guard Bureau in Washington. Although the National Guard Bureau has expressed significant reservations at my authority to require an EIR over this project, I am persuaded that the provisions of the U.S. Clean Waters Act, in addition to the obvious benefits of a carefully-scoped, publicly reviewed environmental planning document, warrant my action today. I stand ready to discuss these issues, and the role MEPA plays in the resolution of environmental disputes, with officials of the Guard Bureau at their convenience.

SCOPE

1. Project Description.

I consider the essential elements of this project to be the following:

i. firing range reconstruction and relocation
ii. construction of new housing
iii. demolition or expansion of the UTES facility

The above project elements may not be undertaken, authorized or supported by Commonwealth personnel until MEPA compliance is complete.

Conversely, other elements of the project reviewed in the Master Plan will have no significant impacts on the environment, and may therefore proceed, with Commonwealth support, at any time. These are:

i. removal of underground fuel storage tanks.
ii. demolition of dilapidated housing or base support structures, other than facilities on the UTES site (e.g., Bomarc missile silos), subject however to compliance with state regulations for any off-base storage or disposal of demolition materials, including asbestos.
iii. rehabilitation of heated brick barracks facilities.
iv. fencing of the base perimeter.
v. above-ground rehabilitation of UTES structures.

The "controlled burn" at Camp Edwards, also discussed in the Master Plan, has been the subject of two previous ENF filings and is the subject of a pending interpretative request, and will be dealt with separately from this EIR.

Study elements proposed in the Master Plan or Environmental Assessement shall be incorporated into the EIR. The noise study will be a central part of the Scope. The Installation Restoration Program should provide necessary groundwater information. The U.S.A.E.H.A. air quality study on propellant combustion should be annexed to the Draft EIR, and will permit a judgment as to the potential significance of air emissions.

The base landfill has been inspected by my office and found to be low-volume and well-documented. While I suggest that the operation of such a large-acreage, low-volume facility is cost-ineffective, I do not consider that it requires any MEPA review at this time.

The project description should summarize all elements studied in the Master Plan, and identify in greater detail all elements specified above for EIR inclusion. It should briefly recount related activities on Camp Edwards/ Otis Air Force Base of all state and federal entities other than MAARNG, and should provide data on person-day use of the facility, broken down between the foregoing entitities, sufficient to give an understanding of the intensity of use of the base, by week-end and week-day, during February, May, August and October. This section should then discuss the typical operations on the base during such times, sufficient to give an understanding of aircraft operations, light and heavy arms activity, and other activities with potential bearing on noise or groundwater. It should be understood that this descriptive section is not to be restricted to MAARNG activities. Its purpose is to familiarize the reviewer with aggregate military activities on base. This shall then constitute the base-line case, against which the potential significance of MAARNG activities may be evaluated.

2. Noise.

a. Technical discussion; criteria. It is essential that the EIR contain a clear and complete discussion of the distinguishing characteristics of ordnance and aircraft noise which characterize the noise environment on Camp Edwards. It seems apparent that the routine noise descriptors (Ldn, dBA, L-90) which serve adequately for ordinary background noise, and serve, with certain limitations, to deal with noise at airports, had scant ability to characterize single or aggregated noise events from machine gun fire, evening small arms fire, howitzers, mortar rounds, tank testing, bomb demolition and aircraft operations. The noise discussion should begin by explaining measurement criteria used for high-intensity, short-duration noise events, discussing where they were developed, the situations to which they are applicable, and how they are measured. This section should also explain how such noise events may be aggregated, and what is known of the psychological effects of such noise.

b. Building on this discussion, the Noise section should explain what has been done to evaluate the noise environment at the base, and discuss the extent to which the noise contours presented in the Environmental Assessment protect against off-base impacts. The focus of attention shall be residentially-zoned private property adjoining the base.

c. Finally, the noise section shall describe how future planning decisions by MAARNG, particularly the siting of additional firing ranges, bear on off-base noise conditions. What mitigation, either in range location, muffling devices, or in LITER ammunition, is available to minimize any nuisance conditions created on off-base private property by on-base MAARNG activities?

3. Groundwater.

The EIR shall report the results of the IRP presently under way to identify the extent and type of existing contamination. It should identify all public or private wells potentially affected and the substances that could affect them. The EIR should also delineate regional (and local, as available) groundwater flow in the area of the base, and map the direction of movement of identified contaminants.

The EIR should present remedial action plans for contamination sites and all correction or compensation plans for plumes moving in groundwater, particularly those immediately affecting or about to affect public or private water supplies.

4. Air Quality.

The EIR should annex the USAEHA study on propellant combustion, identify the amount of propellant burned on a worst-case day at the base, and assess the potential for any off-base effects of such worst case.

The EIR should be circulated to the Selectmen, Planning Boards and Water Departments of Bourne, Falmouth, Mashpee and Sandwich, and to all parties which filed comments on the ENF. Four additional copies shall be lodged in the public libraries of each of the four towns.

February 10, 1986
DATE

James Hoyte
JAMES S. HOYTE, SECRETARY

JSH/SGM/RNF

1.0 INTRODUCTION

The Massachusetts Military Division (MMD) in conjunction with the National Guard Bureau (NGB) has prepared this draft environmental impact statement/environmental impact report (EIS/EIR) for 10 upgrade projects to support the mission of the Massachusetts Army and Air National Guard (MAARNG and MAANG, respectively). This section describes the purpose and need for the proposed action, and the federal and state regulatory framework that will guide the MMD and the NGB to identify a recommended course of action. This section also summarizes the project history, outlines the scope of the document, and describes the public participation process in developing this EIS/EIR. Finally, this section includes a list of relevant previous environmental studies, and identifies the applicable statutory and regulatory environmental compliance requirements for preparation of this document.

1.1 Purpose of and Need for the Proposed Action

The purpose of the proposed action is to provide the necessary training and facilities to maintain the readiness of the Massachusetts National Guard to stay current with changing military training and doctrine. Military units must maintain a high level of training and state of readiness to support national defense and state missions in times of natural disaster, civil unrest, and other emergencies. Adequate training opportunities, with modern ranges and operational support facilities, and up-to-date equipment must be available for military units to achieve their mandated readiness goals. In addition, reductions in the nation's active military forces during the past decade have placed an even greater emphasis on the mission of the Reserve and Guard forces. Combat readiness can only be attained with the availability of modern training and support facilities.

1.2 Scope of the Document

This EIS/EIR analyzes the potential project-related environmental effects associated with the alternatives for the proposed MAARNG and MAANG projects. A joint National Environmental Policy Act/Massachusetts Environmental Policy Act (NEPA/MEPA) document was prepared because implementation of the proposed projects involves both federal and state agencies. In addition, this EIS/EIR was prepared in accordance with a 1989 Consent Decree (Appendix A) resulting from litigation involving the Conservation Law Foundation of New England, Inc., which required, in part, the preparation of an EIS. The NGB is the federal co-lead agency providing funding and approval authority subject to NEPA. MMD is the state lead agency under MEPA and a co-lead agency under NEPA responsible for approving and implementing the projects. The agencies listed above served the following roles during preparation of this EIS/EIR:

- NGB provided project technical assistance and document review.
- Department of the Army provided document review.
- MMD authored the document and provided project management and coordination, technical assistance, document quality assurance and control, and technical review.

This joint EIS/EIR will provide the necessary environmental analysis and documentation to allow NGB to make an informed decision.

1.2.1 Scoping Issues Identified for the EIS/EIR

A joint NEPA/MEPA public scoping meeting was conducted in November 1994, during which a number of issues and concerns regarding the Proposed Action were identified. The following discussion presents a summary of the public and agency comments and concerns received during scoping:

Hazardous Materials/Waste

- Past use of hazardous materials and generation of hazardous wastes have resulted in releases and subsequent groundwater contamination as documented in existing Installation Restoration Program (IRP) studies. There should be no increase in the use of hazardous materials nor further generation of hazardous wastes until past contamination has been remediated.

- Studies by the United States (U.S.) Geological Survey have suggested that a "reserve" of phosphorus and other inorganic chemicals are bound to sediments in the aquifer downgradient of the previously used disposal beds for the wastewater treatment plant (WWTP). Leaching of these inorganic chemicals from the sediments should be addressed.

- Unexploded ordnance management policies should be described.

Water Resources

- Past releases of hazardous materials and hazardous wastes have resulted in the contamination of groundwater, and the subsequent migration of this contamination has threatened municipal water supplies. Groundwater remediation is of paramount concern. MAARNG and MAANG actions must not delay remediation efforts nor contribute to the contamination.

- Recent studies have projected a water supply shortage in the Bourne, Falmouth, Mashpee, and Sandwich areas. Massachusetts Military Reservation (MMR) is located on upper Cape Cod's sole-source aquifer. Potential impacts to future water supplies should be identified and evaluated.

- Potential groundwater contamination associated with impact area activities.

Air Quality

- Air quality impacts of propellant bag burning should be considered. Current Army National Guard policies regarding the management of propellant bags should also be described.

Noise

- Analysis of noise impacts resulting from the continued use of existing ranges and the potential noise impacts of the proposed ranges should be included.

Biological Resources

- Potential impacts to wetlands, vegetation, and wildlife resulting from the construction and operation of the proposed projects should be addressed.

Cultural Resources

- Potential impacts to known or potential archeological sites should be addressed.

Land Use

- Potential impacts to agricultural resources adjacent to the proposed project locations should be discussed.

- Potential land use conflicts between the proposed project locations and Zone II areas (well protection areas) should be addressed.

Utilities

- Projected quantities of potential construction and demolition debris and its disposal should be addressed.

Traffic

- Potential impacts to traffic congestion and traffic patterns resulting from the construction and operation of the proposed projects should be discussed.

1.2.2 Scoping Issues Excluded from the EIS/EIR

Issues and concerns considered beyond the scope of this Draft EIS/EIR were also identified during the scoping process. In general, issues that have been or are currently subject to other independent environmental surveys, studies or programs (incorporated by reference as appropriate to the content of this document) as well as those issues neither directly nor indirectly relevant to the Proposed Action were considered beyond the scope of this Draft EIS/EIR. These out-of-scope issues are as follows:

> Installation Restoration Program. IRP, initiated by the Department of Defense (DoD) in response to the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and the Superfund Amendments and Reauthorization Act of 1986 (SARA), is a program to identify, characterize, and remediate environmental contamination on military installations. Presently, the U.S. Air Force (USAF) is conducting an IRP that defines and implements the procedures necessary for the remediation of past hazardous material releases and disposal practices at MMR. The Council on Environmental Quality (CEQ) and the U.S. Environmental Protection Agency (USEPA) have determined that adherence to CERCLA/SARA is the functional equivalent of an EIS, providing adequate assurances that all environmental factors are given consideration. Therefore, the IRP is a separate and independent process being conducted concurrently with the development of this EIS/EIR and is considered beyond the scope of this document. IRP issues are summarized herein (Section 3.0) to provide a basewide description of the affected environment. The potential hazardous wastes associated with the proposed projects have been evaluated within Section 4.0 of this EIS/EIR.
>
> MAANG Construction Projects. In September 1993, MAANG proposed to construct a communications facility and a medical facility within the cantonment area. These two projects were approved for construction by MEPA Certificates Massachusetts Executive Office of Environmental Affairs (EOEA) No. 9498 (Medical Training Facility) dated September 9, 1993 and EOEA 9520 (Communications Electronics Training Center) also dated September 9, 1993 (Appendix B). In addition, it was stipulated that these projects were not inconsistent with the terms of consent decree and could go forward (Conservation Law Foundation of New England, Inc. versus Temple, 86-1004-S [MA., 1989]). This stipulation was agreed to by all parties.
>
> Master Plan Projects. In accordance with the 1986 Environmental Notification Form (ENF) Certificate and 1989 Consent Decree, certain Camp Edwards Master Plan projects were authorized to proceed without further environmental review/ documentation. As a result, the previously completed, exempt Master Plan projects were considered beyond the scope of this document.

Other. The purpose of this EIS/EIR is to consider the environmental impacts of the Proposed Action before determining a preferred alternative for each of the proposed MAARNG and MAANG projects. The following issues identified during scoping have been considered beyond the scope of this NEPA/MEPA process with regard to the Proposed Action and excluded from analysis in this EIS/EIR:

- Public concern regarding alternative use of MMR facilities as suggested by public comment at the November 4, 1994 Scoping Meeting (e.g., establish nature preserve).
- Public concern regarding real estate value of MMR property (if no longer a military installation).
- Public concern regarding potential health effects from electromagnetic radiation emitted from Precision Acquisition Vehicle Entry-Phased Array Warning System (PAVE-PAWS). PAVE-PAWS is described herein to provide a complete baseline of the MMR affected environment (Section 3.0); however, potential health effects due to the emission of electromagnetic radiation were considered independent of the Proposed Action and, therefore, beyond the scope of this environmental document.
- The Agency for Toxic Substances Disease Register is conducting a health assessment in the vicinity of MMR; and the Silent Spring Institute has received a grant from the Massachusetts Department of Public Health to conduct a study of cancer rates in the communities adjacent to MMR. These studies are concurrent with the development of the EIS/EIR. Analysis to determine any correlation between contaminants at MMR and elevated cancer rates are considered beyond the scope of this EIS/EIR. Refer to MEPA Certificate dated December 8, 1994 found in the Secretarial Decisions section of this document.

1.3 National Environmental Policy Act/Massachusetts Environmental Policy Act

This section introduces the NEPA and MEPA, summarizes the federal and state regulatory environmental project histories, and outlines the EIS and EIR processes.

1.3.1 Introduction to the National Environmental Policy Act

The need to provide environmental documentation for proposed federal actions is based on the statutory requirements of NEPA to balance environmental issues with national priorities. NEPA provides a national policy to guide federal agencies whose activities may potentially affect the environment, and it requires consideration of environmental issues in the federal agency decision-making process. In addition, NEPA provides for public participation in the decision-making process.

Environmental Assessments (EAs) and EISs provide the vehicle for meeting NEPA objectives. The environmental impact analysis process identifies key issues and evaluates pertinent information. The analysis is presented in a comprehensive and concise document that enables federal agencies to consider the full range of environmental consequences of a particular action, or actions, during the decision-making process. Figure 1-1 presents a flow chart of the NEPA process regarding a proposed federal action and the preparation of the corresponding environmental document.

1.3.2 National Environmental Policy Act Project History

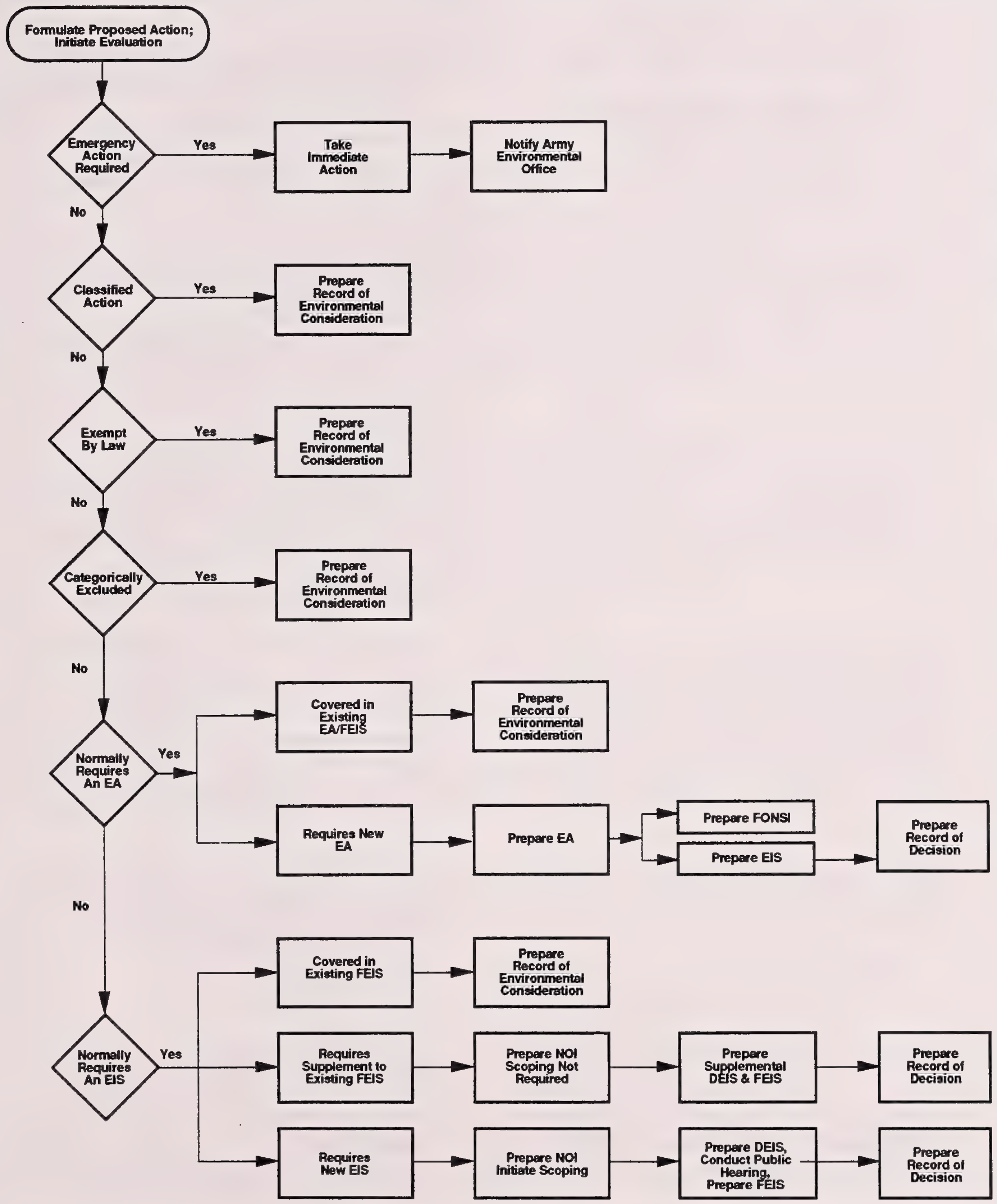
In response to the Camp Edwards Master Plan, revised February 1985, MAARNG prepared and issued an EA in June 1985. Subsequently, the NGB approved the EA and issued a Finding of No Significant Impact in December 1985. Following litigation involving the Conservation Law Foundation of New England, Inc., a Consent Decree (see Appendix A) was negotiated and executed in September 1989, requiring, in part, the preparation of an EIS in accordance with NEPA, the CEQ Regulations for implementing NEPA (40 Code of Federal Regulations [CFR] 1500-1508) and Army Regulations 200-1 and 200-2, Environmental Protection and Enhancement, and Environmental Effects of Army Actions, respectively.

1.3.3 Environmental Impact Statement Process

Preparation of an EIS is a multiple-step process (Figure 1-2) involving the following principal components:

1. Pre-scoping and Formulation of the Proposed Action. The MMD, in conjunction with the NGB, developed a comprehensive project description and need statement. From this description, a range of alternatives was identified to form a Proposed Action for presentation during scoping. The project purpose was broadly defined to allow flexibility in the identification of NEPA alternatives; however, the precise nature and extent of the action will determine the extent of the potential environmental consequences.

2. Scoping. After the NGB (the lead federal agency) published a Notice of Intent (NOI) in the Federal Register to prepare an EIS (August 31, 1994), a public scoping meeting was conducted in November 1994. Scoping has three purposes for the lead agency, 1) to provide responsible agencies and the public with information on the Proposed Action and alternatives under consideration, 2) to provide information on the types of environmental analysis to be included in the EIS, and 3) to receive information on additional concerns, analysis, or alternatives that should be addressed/included in the EIS.


Formulate Proposed Action; Initiate Evaluation
Emergency Action Required
Yes
Take Immediate Action
Notify Army Environmental Office
No
Classified Action
Yes
Prepare Record of Environmental Consideration
No
Exempt By Law
Yes
Prepare Record of Environmental Consideration
No
Categorically Excluded
Yes
Prepare Record of Environmental Consideration
No
Normally Requires An EA
Yes
Covered in Existing EA/FEIS
Prepare Record of Environmental Consideration
Requires New EA
Prepare EA
Prepare FONSI
Prepare EIS
Prepare Record of Decision
No
Normally Requires An EIS
Yes
Covered in Existing FEIS
Prepare Record of Environmental Consideration
Requires Supplement to Existing FEIS
Prepare NOI Scoping Not Required
Prepare Supplemental DEIS & FEIS
Prepare Record of Decision
Requires New EIS
Prepare NOI Initiate Scoping
Prepare DEIS, Conduct Public Hearing, Prepare FEIS
Prepare Record of Decision

Legend

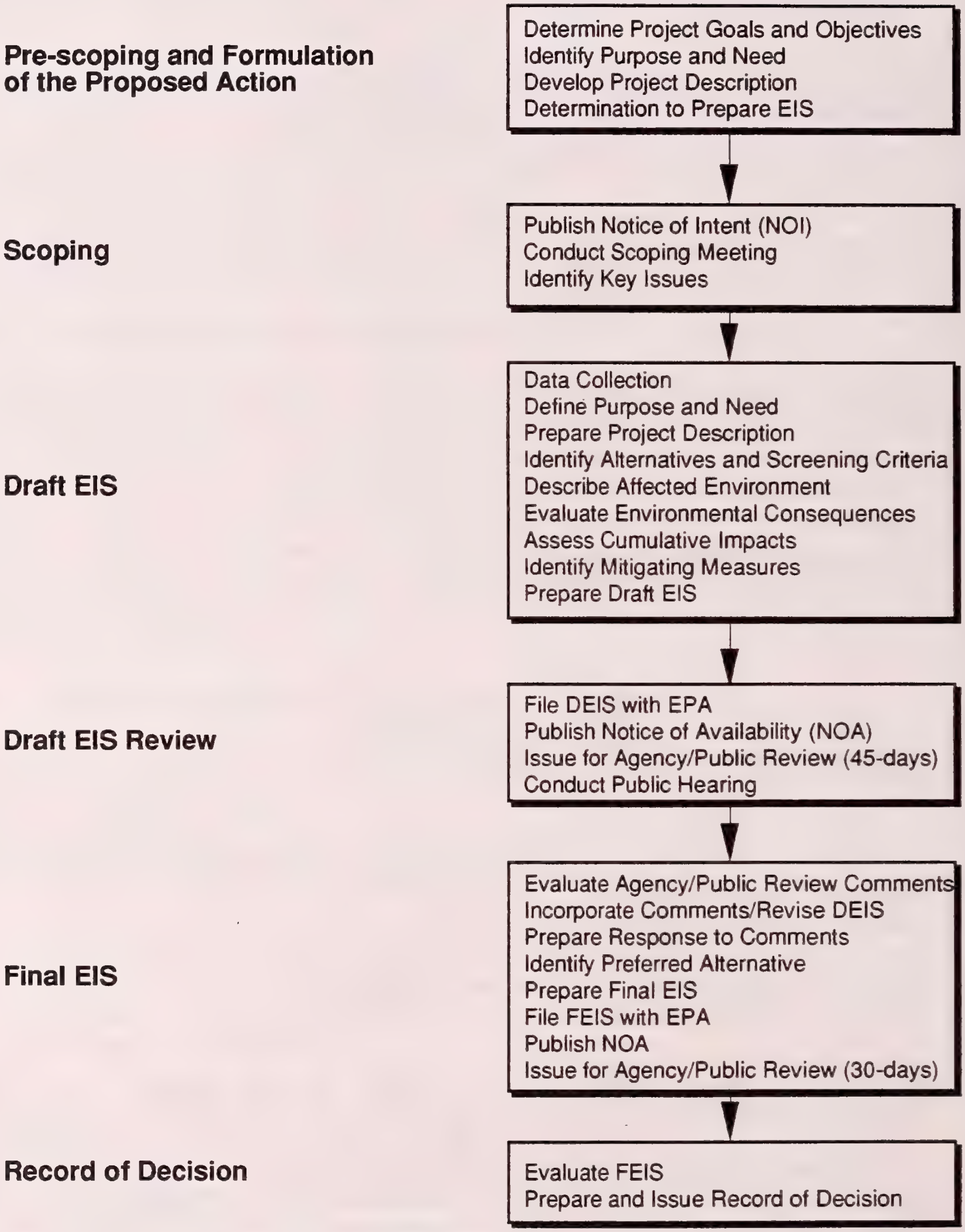
EA - Environmental Assessment
EIS - Environmental Impact Statement
FONSI - Finding of No Significant Impact
NOI - Notice of Intent

Source: 301 CMR 11.00 MEPA Regulations

NEPA Process Flow Chart

File Name: 6650-14

Figure 1-1


Pre-scoping and Formulation of the Proposed Action
Determine Project Goals and Objectives
Identify Purpose and Need
Develop Project Description
Determination to Prepare EIS
Scoping
Publish Notice of Intent (NOI)
Conduct Scoping Meeting
Identify Key Issues
Draft EIS
Data Collection
Define Purpose and Need
Prepare Project Description
Identify Alternatives and Screening Criteria
Describe Affected Environment
Evaluate Environmental Consequences
Assess Cumulative Impacts
Identify Mitigating Measures
Prepare Draft EIS
Draft EIS Review
File DEIS with EPA
Publish Notice of Availability (NOA)
Issue for Agency/Public Review (45-days)
Conduct Public Hearing
Final EIS
Evaluate Agency/Public Review Comments
Incorporate Comments/Revise DEIS
Prepare Response to Comments
Identify Preferred Alternative
Prepare Final EIS
File FEIS with EPA
Publish NOA
Issue for Agency/Public Review (30-days)
Record of Decision
Evaluate FEIS
Prepare and Issue Record of Decision

NEPA: Approach to EIS Preparation

File Name: 6650-14

Figure 1-2

3. Draft EIS. The major components of a Draft EIS include definition of project purpose and need, description of the Proposed Action and development of project alternatives, description of the affected environment, analysis of project-related environmental consequences, assessment of cumulative impacts, and the identification of mitigating measures. Project alternatives must be practicable, responsive, and evaluated within the context of fulfilling the established project purpose and need. Impacts must be evaluated and quantified based on sound technical data that can be assessed easily by the agencies and understood by the public. Mitigation measures, a critical element of an EIS, must be identified where practicable and available to offset project-related impacts.

4. Draft EIS Review. Upon completion of the Draft EIS, the lead agency files a Notice of Availability (NOA) for publication in the Federal Register. In addition, the Draft EIS is made available to agencies, organizations, and the interested public for their review and comment. During the public review period, interested parties provide comments to the lead agency. In addition, the lead agency also conducts a public hearing on the Draft EIS during the review period.

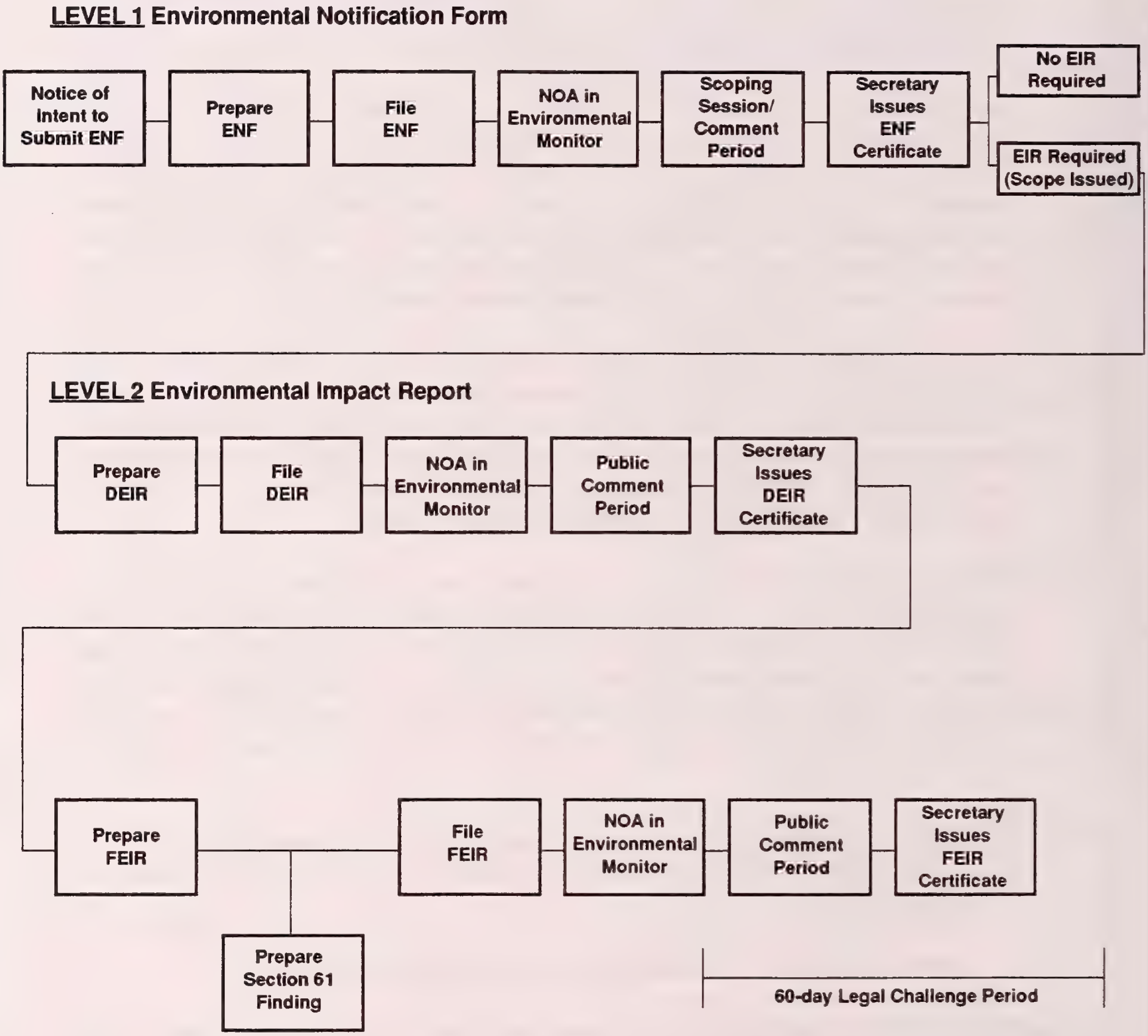
5. Final EIS. Following the close of the public comment period, the lead agency prepares a Final EIS. The Final EIS includes changes and modifications to the document that result from comments received on the Draft EIS, and a section that summarizes all comments received. In addition, the Final EIS must identify a preferred alternative. The Final EIS is filed with USEPA, and a NOA is published in the Federal Register. Typically, the Final EIS is available for agency and public review for 30 days.

6. Record of Decision. The lead agency considers the information presented in the Final EIS and evaluates the preferred alternative. The lead agency then issues a Record of Decision.

1.3.4 Introduction to the Massachusetts Environmental Policy Act

In addition to NEPA, this environmental document must comply with the statutory and regulatory provisions of MEPA (i.e., Massachusetts General Law [MGL] c. 30, s. 61-62H and 301 Code of Massachusetts Regulations [CMR] 11.00, respectively). MEPA applies to the activities of all agencies of the Commonwealth, to all activities carried out with financial assistance from state agencies, and to all activities which require permits granted by state agencies.

MEPA establishes thresholds, a procedure, and a timetable for a two-tiered review process (Figure 1-3). If a project exceeds any of the review thresholds, the project proponent begins the review process by preparing and filing an ENF with the Secretary


LEVEL 1 Environmental Notification Form
Notice of Intent to Submit ENF
Prepare ENF
File ENF
NOA in Environmental Monitor
Scoping Session/ Comment Period
Secretary Issues ENF Certificate
No EIR Required
EIR Required (Scope Issued)
LEVEL 2 Environmental Impact Report
Prepare DEIR
File DEIR
NOA in Environmental Monitor
Public Comment Period
Secretary Issues DEIR Certificate
Prepare FEIR
Prepare Section 61 Finding
File FEIR
NOA in Environmental Monitor
Public Comment Period
Secretary Issues FEIR Certificate
60-day Legal Challenge Period

Legend

ENF - Environmental Notification Form
NOA - Notice of Availability
EIR - Environmental Impact Report

Source: 301 CMR 11.00: MEPA Regulations

MEPA Process Flow Chart

File Name: 6650-14

Figure 1-3

of Environmental Affairs. At the close of the 30-day ENF public review period, the Secretary determines whether an EIR is required. If an EIR is required, it is prepared by the proponent and submitted to the Secretary. A draft and final EIR are circulated for review and comment by agencies, general public, MEPA Unit and the Secretary.

Similar to the EIS, the EIR is an informational planning document that discloses potential environmental consequences for evaluation by agencies and the public. Consequently, an EIR must be prepared early in the project planing and decision-making process, and before any final decision regarding the proposed project.

1.3.5 Massachusetts Environmental Policy Act Project History

In response to the 1985 Camp Edwards Military Reservation Master Plan, MAARNG prepared and submitted an ENF (EOEA No. 5834) which was noticed in the Environmental Monitor on January 10, 1986. As a result, the Secretary issued a Certificate on the ENF on February 10, 1986, requiring the preparation of an EIR for many of the original 58 proposed Master Plan projects.

Subsequent to the 1989 Consent Decree (Appendix A), MAARNG submitted a Notice of Project Change (NPC) to the Secretary regarding a revision to the Camp Edwards Master Plan reducing the number of proposed projects to 17. This NPC was noticed in the Environmental Monitor on December 22, 1992. In response, the Secretary issued a Certificate on the NPC on March 18, 1993, requiring the preparation of an EIR for the 17 revised Master Plan projects.

On October 12, 1994, MAARNG submitted a second NPC that reduced the number of MAARNG projects from 17 to six and added four MAANG projects, for a total of 10 projects. This NPC was noticed in the Environmental Monitor on October 24, 1994.

Consequently, the Secretary issued a Certificate on the NPC on December 8, 1994, requiring the preparation of an EIR for the 10 currently proposed projects referenced as the MMR Master Plan.

On October 25, 1995, the Secretary granted an extension for filing the Draft EIR. As a result, MAARNG is required to submit the EIR to the Secretary by September 15, 1996. An additional extension was requested by MAARNG, dated August 28, 1996, to file the Draft EIR in November 1996 (Appendix C). This extension was required to coordinate the impact area study with the EIR document.

1.3.6 Environmental Impact Report Process

Similar to an EIS, preparation of an EIR is a multi-step process. Unless the Secretary stipulates otherwise in the scoping decision, the depth and level of analysis throughout the EIR should be commensurate with the magnitude of the project, the availability of reasonable alternatives, the methods to reduce impact, and the extent to which detailed analysis would help to resolve uncertainty about significant environmental impacts. As required by the Secretary's Certificate, this EIR follows the outline presented in 301 CMR 11.07 and includes the following:

- Secretarial Decisions
- Summary
- Project Description
- Alternatives to the Proposed Project
- Existing Environment
- Analysis of Effects
- Mitigation Measures
- Appendices
- Section 61 Finding (Final EIR only)

Because the requirements for an EIR are similar to those for an EIS, a combined EIS/EIR can be prepared that complies with both state and federal regulatory requirements.

Review procedures for the Draft EIR include submission to the Secretary and circulation as required by 301 CMR 11.24. Upon receipt, the Secretary shall publish notice of its availability in the Environmental Monitor. The public comment review period for this Draft EIR shall be 90 days from the notice in the Environmental Monitor. As a combined EIS/EIR document, a joint public hearing shall be conducted to solicit public comment. At the close of the comment period, the Secretary shall issue a written statement indicating whether the EIR adequately and properly complies with the provisions of the MEPA regulations.

Upon receipt of the Secretary's statement and comments received in response to the Draft EIR, the proponent shall prepare a final EIR including a proposed Section 61 Finding. The final EIR shall be submitted and circulated in the same manner as a Draft EIR. Similarly, its availability shall be noticed in the Environmental Monitor and interested persons/agencies shall have 30 days to review the document and file comments with the Secretary. Parallel to the EIS Record of Decision, the EIR process concludes with a written statement by the Secretary regarding the adequacy of the final EIR.

Assuming the final EIR withstands the procedural 60-day legal challenge period (Figure 1-3), the proponent has completed its obligations under MEPA and may proceed with the proposed project.

1.4 Public Participation

This section provides an overview of the public involvement process during the development and preparation of this EIS/EIR. Public involvement includes several mandatory and voluntary activities with the overall purpose of supporting the ongoing planning efforts concerning the Proposed Action, and meeting the regulatory requirements of the federal and state environmental assessment and compliance review process. The public involvement process includes dissemination of project information and opportunities for the public to provide comment and to participate in the review of this document. This section describes project-related public participation within the context of the NEPA/MEPA process, newsletters for public outreach, and the Unified Environmental Planning Function. In addition to the public participation efforts described below, MAARNG has established a web page (http://www.tiac.net/users/mmreis) that provides information on the Proposed Action and this EIS/EIR.

1.4.1 National Environmental Policy Act Scoping Process

The CEQ NEPA Implementation Regulations require an early and open process whereby the lead federal agency solicits information and comments from regulatory agencies and the public regarding the most important topics to be evaluated in an EIS (40 CFR 1501.7). This "scoping process" identifies the environmental issues relevant to the Proposed Action and provides the initial opportunity for public participation. Public participation in the Draft EIS is essential to assist the agency in defining an appropriate scope of analysis.

The lead agency initiates the scoping process with the publication of an NOI to prepare an EIS. The NGB, as the lead federal agency, published the NOI to prepare a Draft EIS for proposed construction at MMR in the Federal Register on August 31, 1994 (Appendix D). In addition, letters were sent to federal, state and local agencies, organizations, and the general public requesting their input and comments on the content of the Draft EIS.

On November 2, 1994, a public scoping meeting was conducted at the Morse Pond School in Falmouth, Massachusetts, to solicit further comment and information on the Proposed Action, project alternatives, impact analysis and recommended mitigation measures. Advance notification of this meeting was publicized in legal notices appearing in local newspapers serving Barnstable County. Approximately 100 people attended the meeting. Representatives from the NGB, EOEA, MAARNG and MAANG presented an overview of the joint NEPA/MEPA (EIS/EIR) process and procedures, and a brief description of the proposed MAARNG and MAANG projects. These representatives were also available before and after the meeting to meet the public, respond to questions and distribute informational packets on MMR, the Proposed Action and the NEPA/MEPA process.

After the Draft EIS is issued and the NOA is published in the Federal Register, interested parties typically have 45 days to comment. For purposes of this NEPA/MEPA process, the public comment period has been extended to 90 days to allow for additional public input. During this comment period, a public hearing will be conducted and the lead agency will present the findings of the Draft EIS. All comments received during the public review period must be considered by the lead agency and the Draft EIS must be revised, as appropriate, in response to these comments before filing the Final EIS.

1.4.2 Massachusetts Environmental Policy Act Scoping Process

Initial public involvement relating to the Proposed Action dates began during the development of the Camp Edwards Master Plan in 1984 when a series of public hearings were conducted. Subsequently, the EA for the Master Plan (as revised) was released for public review in 1985. On January 10, 1986, the ENF for the Camp Edwards Master Plan, involving 58 projects, was noticed in the Environmental Monitor for public comment. It was determined that the proposed project (EOEA No. 5834) required the preparation of an EIR.

During December 1992, MAARNG submitted an NPC for a revised Master Plan involving 17 projects which appeared in the Environmental Monitor on December 22, 1992. Similarly, an EIR was required. In response to a second NPC published in the Environmental Monitor on October 24, 1994, the public was further afforded the opportunity to review the proposed project. As a result, it was determined that the six MAARNG and four MAANG currently proposed projects required an EIR. As participants in the joint NEPA/MEPA process, EOEA representatives participated in the November 2, 1994 scoping meeting.

The NPC Certificate dated December 8, 1994, requested the establishment of a Community Working Group (CWG) to assist in the review of the environmental document, and to increase public participation. MEPA sponsored the CWG and attempted to obtain a membership of 12 to 15 people. To date, only eight individuals have volunteered and MEPA has chosen not to activate the group. Public information sessions (open houses) will be held in Falmouth, Bourne, Mashpee, and Sandwich following the release of this Draft EIS and before the public hearing.

1.4.3 Newsletter

MAARNG prepared and widely distributed several newsletters during preparation of the Draft EIS/EIR. Focus, authorized and funded by the DoD to provide the public with information regarding the MMR EIS/EIR, periodically updated the public concerning project developments and provided the public with an opportunity to offer comments.

The newsletter mailing list was developed during scoping, and those who expressed interest in the MMR EIS/EIR were added to the project mailing list by notifying MAARNG at Camp Curtis Guild or the Unified Environmental Planning Function at MMR. At the time this Draft EIS/EIR was issued for public review, Focus had a mailing list of more than 1,200 agencies, organizations and area residents.

1.4.4 Unified Environmental Planning Function

The Unified Environmental Planning Function office at MMR provided an additional on-site resource available to the public for information regarding the status of the MMR EIS/EIR, and received written comments from the public in response to the NOI.

1.5 Previous Environmental Studies

A number of previous environmental studies have been conducted on various activities and operations at MMR. Site-specific technical reports have been prepared on air quality, noise, natural resources, cultural resources, water resources, hazardous waste, waste disposal, public health and land use. In addition, several NEPA/MEPA environmental documents have been prepared for previously proposed actions. The following studies are some of the sources used for the environmental analysis presented in this EIS/EIR:

- Master Plan, Camp Edwards Military Reservation, 1984, Rev. 1985 (MAARNG, 1995a)
- Environmental Assessment (EA), Camp Edwards Military Reservation, 1985 (MAARNG, 1985b)
- Environmental Management Analysis Program for MMR, 1991 (James M. Montgomery Consulting Engineering, Inc., 1991)
- Final EIS/EIR, Wastewater Treatment Facility for Otis Air National Guard Base (ANGB), 1990 (NGB, 1990)
- Environmental Assessment (EA), Aircraft Conversion, 102nd Fighter Interceptor Wing, 1987 (NGB, 1987)
- EIR, Prescription Burning of the Impact Area at Camp Edwards, 1988 (MAARNG, 1988a)
- Environmental Survey of Textron Cape Operations J-3 Range, 1993 (ENSR, 1993)

- Environmental Noise Consultation No. 52-34-0699-91 Updated Noise Contours, Camp Edwards, 1991 (U.S. Army Environmental Hygiene Agency, 1991)
- Environmental Noise Consultation No. 52-FL-4752-96, Existing and Future Noise Contours, Camp Edwards, 1996 (U.S. Army Environmental Hygiene Agency, 1996)
- U.S. Air Force Installation Compatible Use Zone (AICUZ) Study, 1996 (MAANG, 1996)
- A Floristic Survey of Camp Edwards, Final Report, 1995 (Jenkins, 1995a)
- Cultural Resource Reconnaissance of Camp Edwards Training Site, 1987 (Davin and Gallagher, 1987)
- Intensive Archaeological Survey of the Proposed Wastewater Treatment Facilities Project at Otis ANGB, 1990 (Macomber, 1991)

Other studies completed during preparation of the EIS/EIR are listed in Section 5.0 of this document.

1.6 Relevant Statutory and Regulatory Environmental Compliance

This EIS/EIR has been prepared in compliance with the following federal and state statutes, regulations and directives regarding the proposed projects:

General

- National Environmental Policy Act (NEPA) of 1969, as amended (42 U.S.C. 4321-4347)
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 CFR 1500-1508)
- Massachusetts Environmental Policy Act (MEPA) (MGL. c.30 ss. 61-62 H)
- Massachusetts Environmental Policy Act (MEPA) Regulations (301 CMR 11.00)
- Army Regulation 200-1, Environmental Protection and Enhancement (AR-200-1)
- Army Regulation 200-2, Environmental Effects of Army Actions (AR-200-2)
- Army Regulation 200-3, Natural Resources Land, Forest, and Wildlife Management (AR-200-3)
- Air Force Instruction (AFI) 32-7061, The Environmental Impact Analysis Process (AFI-32-7061)
- U.S. District Court, District of Massachusetts Consent Decree, 1989 (Civil Action No. 86-1044-S).

The following regulations also apply to the individual resources in addition to the general laws and regulations discussed above:

Air Quality

- Federal Clean Air Act (CAA) and Federal Clean Air Act Amendments (CAAA) (42 U.S.C. 7401 et. seq.)
- Massachusetts Air Pollution Control Regulations (310 CMR 7.00)
- State Implementation Plan

Noise

- Noise Pollution Control Act of 1972 (42 U.S.C. 490 et. seq.)
- U.S. Army Installation Compatible Use Zone program (ICUZ)
- U.S. Air Force Air Installation Compatible Use Zone (AICUZ) program

Earth Resources

- Farmland Protection Policy Act (7 CFR Ch.VI, Part 658)

Water Resources

- Clean Water Act (CWA), as amended (33 U.S.C. 1251 et. seq.)
- Safe Drinking Water Act (Public Law 95-523)
- Massachusetts Drinking Water Regulations (310 CMR 22)
- Massachusetts Clean Water Act (CWA) (314 CMR 1-15)
- Massachusetts Wellhead Protection Regulations (310 CMR 24)

Biological Resources

- Endangered Species Act of 1973, as amended (16 U.S.C. 668aa-668cc)
- Fish and Wildlife Coordination Act (16 U.S.C. 661-666c)
- Executive Order (EO) 11990, Protection of Wetlands, 24 May 1977
- Executive Order (EO) 12088, Federal Compliance with Pollution Control Standards)
- Massachusetts Endangered Species Act (321 CMR 10 et. seq.)

Land Use

None

Cultural Resources

- National Historic Preservation Act (NHPA) of 1966, as amended (16 U.S.C. 470)
- Archeological and Historic Preservation Act (AHPA) of 1974, (16 U.S.C. 460)
- Executive Order (EO) 11593, Protection and Enhancement of the Cultural Environment, 13 May 1971
- Native American Graves Protection and Repatriation Act (NAGPRA) (25 U.S.C. 2500)
- American Indian Religious Freedom Act (AIRFA) (Public Law 95-341)
- Archeological Resources Protection Act (ARPA) of 1979, (16 U.S.C. 470)
- Curation of Federally-Owned and Administered Archeological Collections (36 CFR 79)
- Army Regulation 420-40, Facilities Engineering Historic Preservation (Draft Army Regulation 200-4, Cultural Resource Management)
- Massachusetts General Laws (MGLs), Chapter 9, Sections 26 and 27C as amended by Chapter 254 of the Acts of 1988 (950 CMR 70.00 and 950 CMR 71.00)

Hazardous Materials and Hazardous Waste Management

- Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) (42 U.S.C. 9601 et. seq.)
- Resource Conservation and Recovery Act (RCRA) (42 U.S.C. 6901 et. seq.)
- National Emission Standards for Hazardous Air Pollutants (40 CFR 61)
- Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 136 et. seq.)
- Toxic Substance Control Act (TSCA) (Public Law 100-368)
- Massachusetts Contingency Plan (310 CMR 40)

Utilities

None

Transportation

None

Socioeconomics

- Executive Order (EO) 12898, Federal Actions to Address Environmental Justice in Minority and Low-Income Populations.

2.0 PROJECT DESCRIPTIONS AND ALTERNATIVES

This section provides a historical overview of the Master Plan Projects and a description of alternative development and screening criteria. This section also provides a detailed description of the six MAARNG and four MAANG proposed projects and their alternatives. For ease of analysis and presentation, the 10 proposed projects have been separated into five range projects and five cantonment projects.

2.1 Revised Master Plan Description

The 1985 Master Plan included 58 projects for construction at the Camp Edwards Training Site (MAARNG, 1985a). In contrast, the current action involves 10 projects regarding the upgrade of MMR. In accordance with the Certificate of the Secretary of Environmental Affairs on the NPC dated December 8, 1994, this section provides a description of any changes from similar elements identified in the 1985 Master Plan and from what currently exists at the base.

Of the original 58 projects, only six remain to be analyzed in this EIS/EIR. The disposition of the other 52 projects have been categorized as follows:

- one project not authorized by the NGB;
- 19 projects not required due to re-evaluation and changes in mission requirements and force structure;
- 21 projects exempted by the 1986 Certificate of the Secretary of Environmental Affairs regarding the ENF and the 1989 Consent Decree. Those projects have been completed as routine maintenance, or specifically authorized for execution by either the Certificate or the Consent Decree;
- six projects changed from new construction to repair of existing facilities. The Consent Decree exempted those projects involving repair of existing facilities from further study; and
- five projects not funded by NGB.

The six remaining MAARNG projects (five range projects and one cantonment project) include the following facilities:

- Modified Record Fire Range (MRFR);
- Multi-Purpose Machine Gun Transition Range (MPMR);
- Infantry Squad Battle Course (ISBC);
- Military Operations on Urbanized Terrain-Military Assault Course (MOUT-MAC);

- Military Operations on Urbanized Terrain-Collective Training Facility (MOUT-CTF); and,
- Unit Training Equipment Site (UTES).

In addition to the six MAARNG projects, four proposed MAANG projects were incorporated into this EIS/EIR as a direct result of the 1989 Consent Decree's requirement that an EIS be prepared to address the entire MMR rather than the Camp Edwards Training Site exclusively. These four projects include an Airfield Control Tower, Aircraft Generation Unit (AGU) Facility, Fire Station and Environmental Facility.

2.2 Evaluation of Alternative Site Locations

The evaluation process included the following considerations: military installations within NGB authorized travel distances; support for mission fulfillment; and access to ranges required to support the mission of the Massachusetts National Guard. Figure 2-1 provides a flow diagram of the alternative development and screening process. Alternative locations (i.e., military installations) for each of the 10 proposed projects are presented in Figure 2-2.

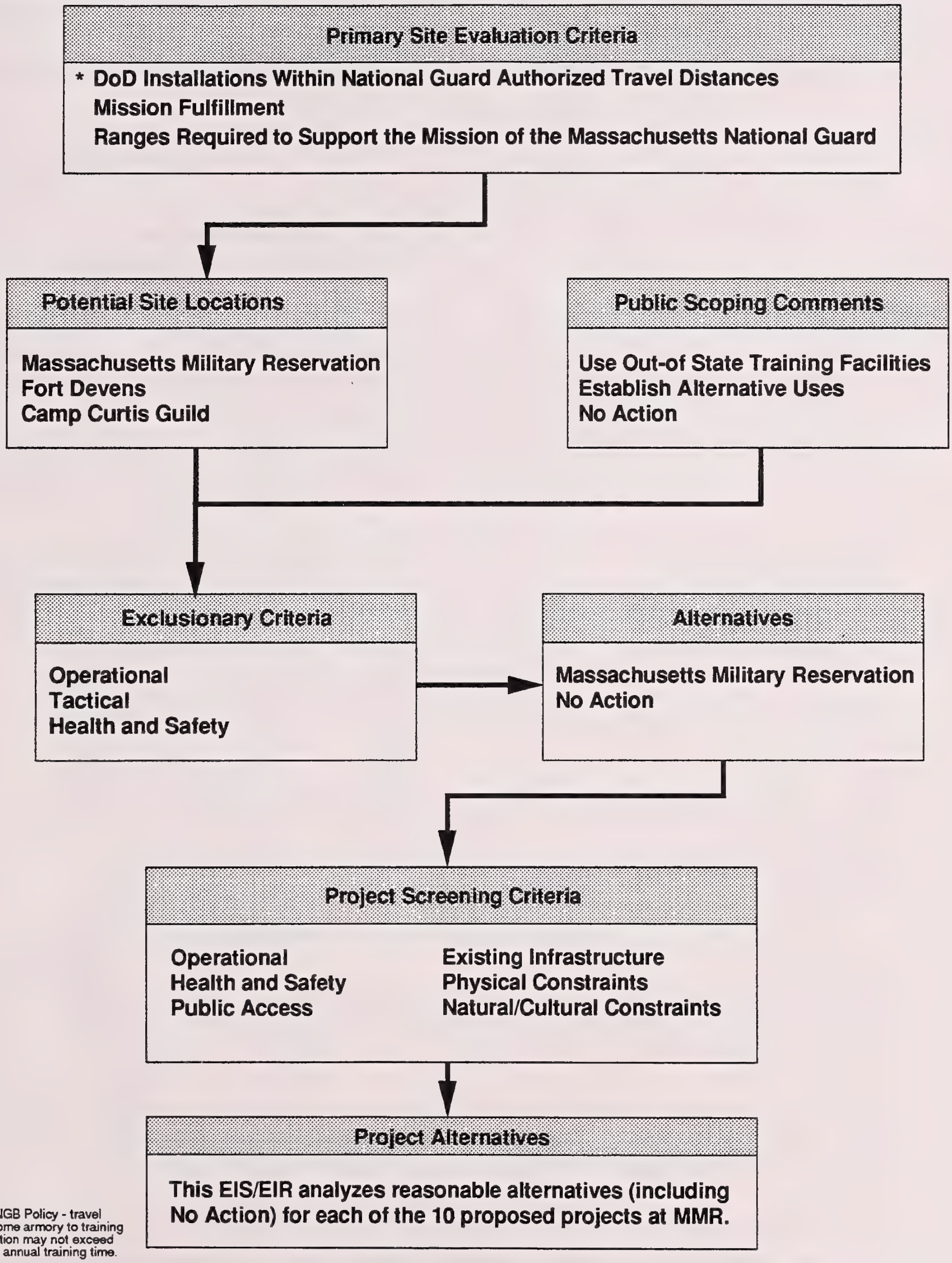
Out-of-state training opportunities exist at Fort Pickett, Virginia, Fort Dix, New Jersey, and Fort Drum, New York; however, travel time to these installations is far above what is recommended in NGB training manuals. The Army National Guard training manual (NGR AR 350-1, Army National Guard Training) requires travel to a site should be, at most, 25 percent of available training time. Therefore, these sites were eliminated from further consideration.

Three installations within the Commonwealth provide the opportunity and facilities to maintain the readiness of the Massachusetts National Guard: MMR, Fort Devens, and Camp Curtis Guild. Other military installations, armories and training opportunities exist within Massachusetts; however, these properties either have restricted use (i.e., non-live fire only) and/or do not provide the ranges, training area, support facilities, and/or space necessary to accommodate the proposed projects (U.S. Army, 1988c).

Because the five Cantonment Projects are necessary to support mission fulfillment at Otis ANGB and Camp Edwards, alternative locations other than at MMR were eliminated from further consideration.

Range Project alternative locations evaluated in this EIS/EIR include the following locations:

Fort Devens. Fort Devens was an approximately 9,300-acre U.S. Army installation located in north-central Massachusetts, approximately 30 miles northwest (NW) of Boston (U.S. Army Corps of Engineers [USACOE], 1995). In 1991, the Defense Base

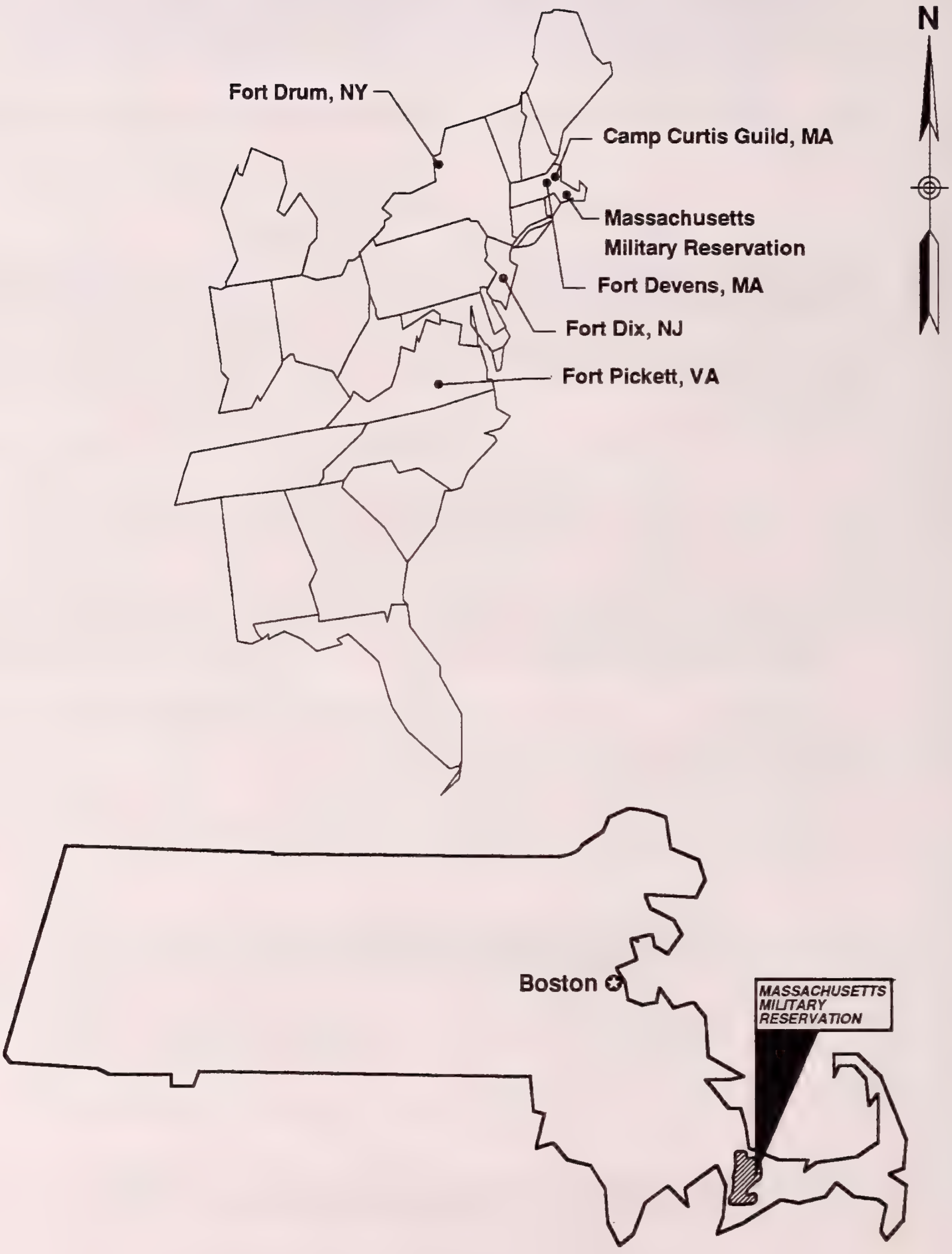

Primary Site Evaluation Criteria
* DoD Installations Within National Guard Authorized Travel Distances
Mission Fulfillment
Ranges Required to Support the Mission of the Massachusetts National Guard
Potential Site Locations
Massachusetts Military Reservation
Fort Devens
Camp Curtis Guild
Public Scoping Comments
Use Out-of State Training Facilities
Establish Alternative Uses
No Action
Exclusionary Criteria
Operational
Tactical
Health and Safety
Alternatives
Massachusetts Military Reservation
No Action
Project Screening Criteria
Operational
Health and Safety
Public Access
Existing Infrastructure
Physical Constraints
Natural/Cultural Constraints
Project Alternatives
This EIS/EIR analyzes reasonable alternatives (including No Action) for each of the 10 proposed projects at MMR.

* Note: NGB Policy - travel from home armory to training installation may not exceed 25% of annual training time.

ALTERNATIVES DEVELOPMENT AND SCREENING PROCESS

File Name: 6650-14 MMR

Figure 2-1



SITE LOCATION EVALUATION AND MMR VICINITY MAP

File Name: 6650-14

Figure 2-2

Realignment and Closure Commission recommended to the President that Fort Devens close, retaining approximately 4,580 acres and those facilities essential to support Reserve Component training requirements. In July 1991, President Bush approved this recommendation and forwarded the recommendation to Congress for approval. As a result, Fort Devens closed in March 1996.

Approximately 4,880 acres of Fort Devens remains as a reserve enclave under the responsibility of Fort McCoy, Wisconsin. This portion of Fort Devens is commonly referred to as South Post. Approximately 4,580 acres of South Post are designated for training uses that include 21 training areas, several range areas, and an impact area (USACOE, 1995). The remaining 300 acres of South Post are used as buffer zone and open space due to physiographic conditions, such as wetlands and steep terrain, which are unsuitable for training purposes.

Locating the MRFR, MPMR, and ISBC on South Post is not considered practicable for the following reasons:

- The impact and training area on South Post is only 4,580 acres (approximately 14,700 acres at MMR), and available space for new development is limited.
- Wetlands, state-listed threatened and endangered species and habitat, and potential archeological resources exist throughout South Post which limit potential development.
- Two locations on South Post were considered for MOUT-MAC and MOUT-CTF: 1) southwest of the relocated Ammunition Supply Point on the northeast (NE) corner of South Post and 2) a former Explosive Ordnance Detonation site. A review of these potential locations at Fort Devens was conducted in July 1995. Subsequently these alternatives were eliminated from further consideration for the following three reasons:

  1. The explosive safety quantity distance around the proposed Ammunition Supply Point (a buffer zone as protection in the event of an accidental explosion) is such that it would conflict with the potential location of the MOUT facilities;
  2. The required 200 to 300 acres of land surrounding the potential Military Operations on (MOUT-CTF) locations to be used for staging, maneuvering, and approach to the facility is not available without restricting the use and operation of existing ranges; and,
  3. Operating the MOUT facilities at either of the proposed locations would restrict the use of other existing ranges.

Camp Curtis Guild. Camp Curtis Guild is an active Massachusetts National Guard training area located in Reading, Massachusetts. This facility consists of approximately 600 acres and includes five rifle and pistol ranges as well as administrative and classroom buildings, vehicle maintenance facilities, and an armory housing the State Headquarters of MAARNG.

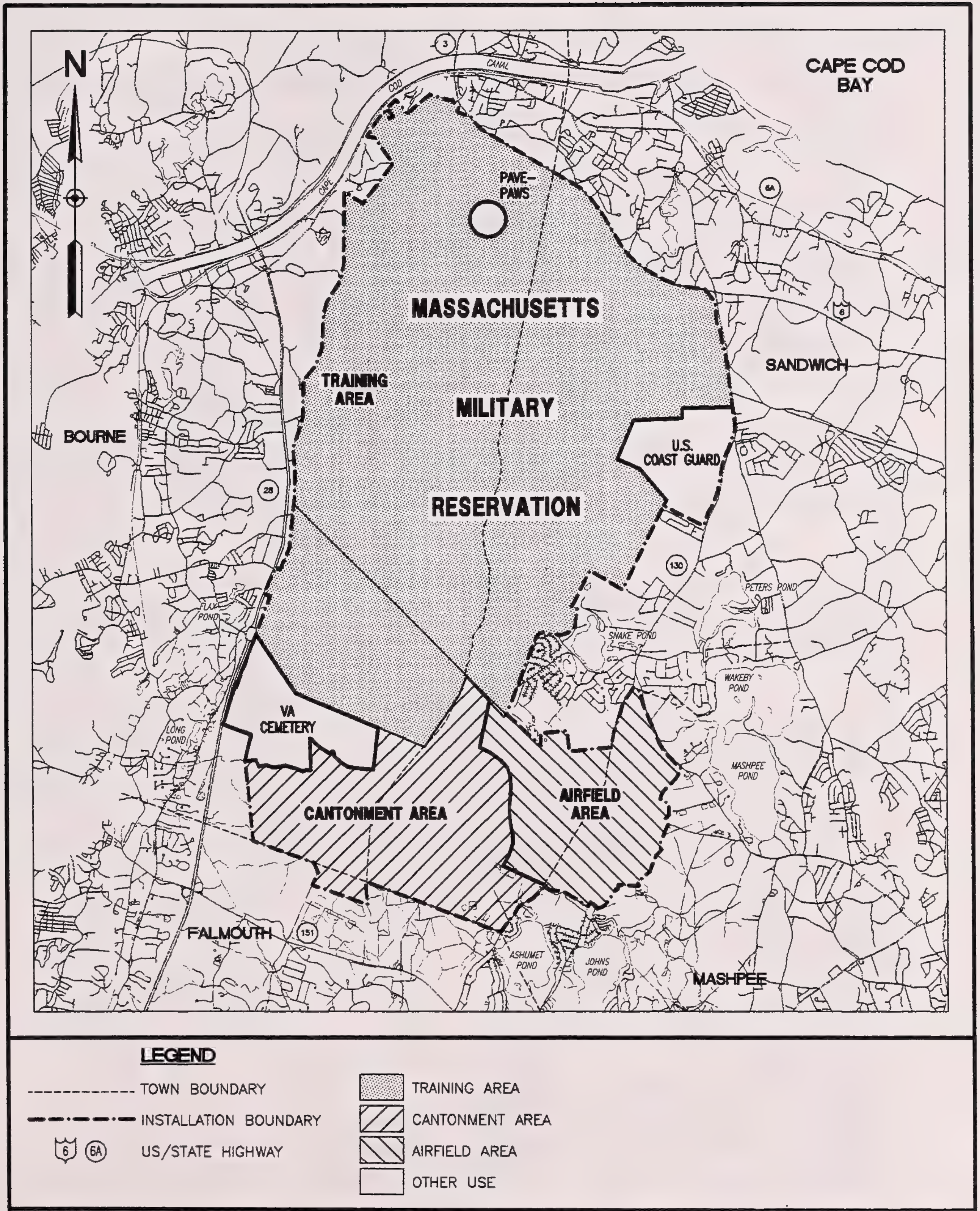
The construction and operation of any of these range facilities at Camp Curtis Guild is not possible due to range safety considerations. Camp Curtis Guild allows for no more than 10-meter (m) machine gun ranges and 200-m known distance rifle ranges. These distances are too short for the construction of the proposed ranges. In addition the existing surface danger zones (SDZs) for the ranges at Camp Curtis Guild encompass the majority of the property. Therefore, adequate space for new ranges and support facilities is not available. In addition, when ranges at Camp Curtis Guild are active, no other portion of the training areas forward of the firing line is available for any other training use.

Massachusetts Military Reservation. MMR is located on the upper or western portion of Cape Cod in Barnstable County, Massachusetts, approximately 60 miles south of Boston and immediately southeast (SE) of the Cape Cod Canal (Figure 2-2). The towns of Falmouth, Bourne, Sandwich and Mashpee intersect on MMR property (Figure 2-3). MMR occupies approximately 21,000 acres of land owned primarily by the Commonwealth of Massachusetts and is controlled by several cooperating occupants.

These occupants include, but are not limited to, the MAARNG, the MAANG, the USAF, the U.S. Coast Guard (USCG), the Veterans Administration (VA), the U.S. Marine Corps (USMC), the U.S. Department of Agriculture (USDA), the Federal Aviation Administration (FAA), Textron Cape Operations (an independent DoD Contractor), and the Bourne Public Schools (Figure 2-4).

The three main areas of MMR are the cantonment area, the airfield area, and the range area. The cantonment and airfield areas include approximately 5,500 acres of developed land and are the locations of most administrative and operational facilities, including flight lines, aircraft maintenance, vehicle maintenance, housing, utilities, support facilities, and the 750-acre National Cemetery which is primarily under the control of the VA. The remaining 14,700 acres include the firing ranges, and the maneuver and impact area controlled by MAARNG. The USAF Cape Cod Air Station and the USCG transmitter site are located in the northern and western portions of the range area, respectively (see Figure 2-4).

As a result of the process by which each of the alternative site locations were evaluated, MMR remained as the only practicable site for construction of the proposed range projects. A more detailed description of MMR is presented in Section 3.2.

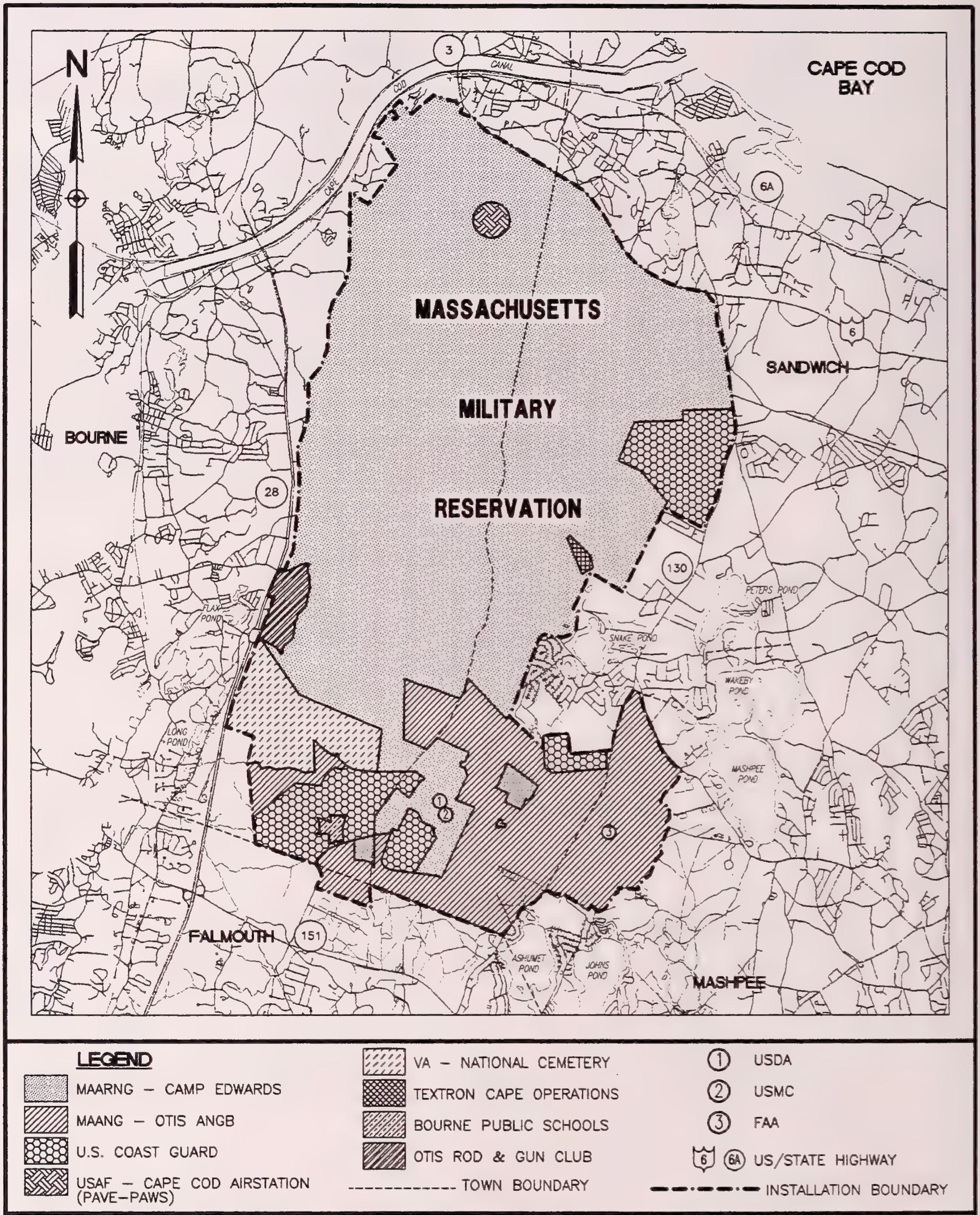


Source: Massachusetts Military Reservation

SITE LOCATION MAP

File Name: J:\6650-14\6650F026.DWG

Figure 2-3



0 4000 8000 FEET

1"=8000'

Source: James M. Montgomery, 1991

MMR ACTIVITIES

File Name: J:\6650-14\6650F027.DWG

Figure 2-4

2.3 Alternatives Development and Screening Criteria

Range and Cantonment project alternative locations at MMR were evaluated using some or all of the following operational and tactical criteria: mission fulfillment; current training standards; logistics (available training time versus travel time); range condition; availability; topography; vegetation; proximity to utility services; proximity to existing road network; range safety; range conflicts; proximity to natural/cultural resources (i.e., wetlands, threatened or endangered species and/or habitat, and known/potential archeological sites); and noise considerations. The application of each of the screening criteria is discussed below.

Mission Fulfillment. This criterion was used to evaluate whether the location or subsequent operation of an alternative contributed to overall mission requirements as described by military field manuals and operational requirements for each of the proposed projects.

Current Training Standards. This criterion was applied only to the Range Projects and was used to evaluate whether an alternative location or subsequent operation of an alternative met or exceeded current training standards as defined by the U.S. Army field manuals for each of the proposed range projects.

Logistics. Because National Guard training time is limited (approximately 30 hours of available training time each inactive duty training [IDT] weekend), optimum and efficient use of training time is paramount to conducting effective training. Troop travel time to and from training sites detract from actual training time. National Guard policy states each local training site should be located, wherever possible, within round trip travel time that does not exceed 25 percent of available training time (National Guard Bureau, 1991).

Range Condition. The operation and condition of existing training facilities and whether they met minimum required training standards were also considered in the screening process.

Availability. Availability of training sites was considered in determining whether an alternative was feasible for the proposed range projects based on project requirements.

Topography. Topography was used to evaluate whether an alternative location was practicable. Terrain features and engineering (earth moving) necessary to construct the projects at each alternative location were considered to determine the topographic constraints associated with each of the alternatives.

Vegetation. Existing vegetative cover was used to evaluate whether an alternative location provides the potential training realism required to meet tactical training requirements.

Proximity to Utility Services. Access to utility services and feasibility of access were considered in determining if an alternative was reasonable.

Proximity to Existing Road Network. The existing road and trail network was considered when determining the feasibility of each alternative's ingress/egress, operational requirements, and/or troop and public access.

Range Conflicts. The existing ranges and associated range SDZs (required safety distances for ricochets, etc.) are situated around the impact area to enhance and maximize safety while providing for optimum range use. Because many SDZs overlap, the use of some ranges may preclude concurrent use of other ranges. The operational effect (range conflicts) each alternative location may have on the existing range configuration was considered in the alternative screening process.

Use of Existing Range. The use of abandoned or under-utilized existing ranges was considered in determining project alternative locations.

Noise Considerations. Noise effects resulting from the operation of the proposed projects and proximity to off-post residences were considered in evaluating potential alternative locations.

Natural/Cultural Resources. Proximity to natural resources such as wetlands and threatened or endangered species and/or habitat, and known/potential archeological or historic resources was considered in the alternative screening process.

Project alternative locations at MMR that failed to meet the criteria listed above were eliminated from further consideration. Project alternatives that did meet the above criteria are included for environmental analysis within this document and are presented in Section 2.6. Prior to presenting the alternative locations at MMR, a detailed description of the 10 proposed Range and Cantonment Projects is provided below in Sections 2.4 and 2.5.

2.4 Range Project Descriptions

This section provides an overview of the five proposed MAARNG range projects: MRFR; MPMR; ISBC; MOUT-MAC; and, MOUT-CTF. This discussion includes the project purpose, project descriptions, and descriptions of existing training activities and specific siting requirements. Table 2-1 provides a summary of the proposed Range Projects. Based on Camp Edwards Range Regulations, normal range use occurs between the hours of 8:00 am and 10:00 pm (MAARNG, 1994b).

Table 2-1
Range Project Description Summary

Proposed Project	Acreage Required (Excluding Safety Distance Zone)	Maximum Reasonable Capacity per Year (Soldiers)	Projected Annual Utilization
MRFR	24	10,960	7,483 Soldiers
MPMR	60	4,110	939 Soldiers
ISBC	185	685 Squads/6,850 Soldiers	81 Squads/810 Soldiers
MOUT-MAC	10	1,370 Squads/13,700 Soldiers 21,000 Civilian	318 Squads/3,180 Soldiers 1,673 Civilian
MOUT-CTF	8	137 Companies/13,700 Soldiers 21,000 Civilian	18 Companies/1,800 Soldiers 1,673 Civilian

2.4.1 Modified Record Fire Range

Project Purpose. The MRFR is a live-fire M16 rifle qualification range designed to train and test (to current U.S. Army training and qualification standards) a soldier's ability to identify and engage targets under realistic conditions (U.S. Army, 1992).

Project Description. Training at an MRFR includes zeroing the weapon, practice fire, day and night qualification, and qualification wearing protective equipment required if operating in an environment contaminated with nuclear, biological, or chemical agents. Zeroing an M16 rifle includes aligning the weapon sight with the rifle barrel. When a rifle is zeroed correctly, the sights are adjusted so that a bullet impacts the point of aim at a given range. The standard battle sight zero range is 25 m. All soldiers in the U.S. Army are required to qualify on their assigned weapon at least annually by firing upon an MRFR (U.S. Army, 1989a).

The MRFR requires approximately 24 acres of land and includes the following facilities:

- a 16-lane firing range;
- nine automated targets (per lane) emplaced in concrete located from approximately 50 to 300 yards down range (a total of 144 targets);
- a 120-square-foot (sf) range tower;
- an 800-sf operations/storage building;
- an 800-sf general instructional facility;
- a 120-sf ammunition breakdown building;
- a 760-sf covered dining shelter;
- a 576-sf bleacher enclosure;
- a 192-sf latrine;
- a 700-sf crushed stone parking area; and,
- crushed stone entrance and service roads (U.S. Army, 1988a).

In addition to the MRFR facility, the SDZ will require an additional 962 acres extending into the impact area. The SDZ does not require physical alteration, but will serve as a buffer zone for protection from potential ricochets (U.S. Army, 1983).

Subtracting holiday weekends, Camp Edwards is available for training use on a year-round basis, approximately 315 days per year. However, based on historic Range Control records, the average military use of Camp Edward's ranges is approximately 137 days per year. Of the possible 52 weekends each year, 46 weekends (92 days) are routinely used for military training because Army Guard and Reserve units typically do not train on holiday weekends. The remaining 45 days (137 minus 92) are accounted for during Army National Guard and Reserve 15-day Annual Training (AT). A typical AT period is conducted from Saturday to Saturday; however, only 12 days are available for training because three days are lost in travel to and from Camp Edwards. Of the 12 available training days, three weekend days are included in the 46 weekends discussed above (nine additional training days remain). Camp Edwards has historically supported five AT periods per year which account for the remaining 45 available training days.

As stated above, the MRFR is projected to be used approximately 137 days per year. Average process time through the course is three hours per soldier with an average of 15 training hours daily (see Section 2.4). Given 16 functioning lanes this would equate to a daily throughput of 80 soldiers. Based on the approximate annual use of Camp Edwards discussed above, annual throughput would be 10,960 soldiers per year. This is the maximum reasonable capacity for the facility. The maximum reasonable capacity is defined as the maximum number of soldiers a range at MMR could support, assuming 100 percent efficiency and use, in one training year. Each soldier is required to fire 100 rounds during qualification. This equates to a maximum reasonable throughput of 1,096,000 rounds of 5.56 millimeter (mm) ball ammunition.

The projected annual utilization is estimated to be lower than the maximum reasonable throughput (1,096,000 rounds). Projected annual utilization is the number of soldiers realistically expected to use a range at MMR while allowing for such factors as unit inefficiency and range availability. Unit inefficiencies include, but are not limited to, weapon malfunctions and soldiers scheduled to train who are not present the actual day of range use. Range availability accounts for operational inefficiencies such as target breakdowns or bans on the use of particular ammunition types due to existing weather conditions. A 10 percent and 5 percent reduction for unit inefficiency and range availability, respectively, were included in the calculations to determine the projected annual utilization.

Units training on weekends typically leave the training site by noon on Sunday in order to return to their home armories and clean and store their assigned equipment. For the MRFR, this reduces the potential throughput for that day from five soldiers per lane to two soldiers per lane or a total of 32 soldiers using the range on IDT Sundays. Range use was calculated as shown below to derive a projected annual utilization of 7,483 soldiers.

MRFR PROJECTED ANNUAL UTILIZATION

Soldiers firing per lane on Saturday multiplied by number of lanes *5 soldiers * 16 lanes = 80 soldiers*	80
Soldiers firing per lane on Sunday multiplied by number of lanes *2 soldiers * 16 lanes = 32 soldiers*	32
Total soldiers firing per weekend (combined Saturday and Sunday totals) *80 + 32 = 112 soldiers per weekend*	112
Annual total firing on weekends during IDT (occurs 46 weekends/year) *112 soldiers * 46 weekends = 5,152 soldiers*	5,152
Annual total firing on weekdays during AT (occurs 45 weekdays/year) *80 soldiers * 45 weekdays = 3,600 soldiers*	3,600
Total soldiers firing (combines weekend and weekday totals) *5,152 weekend + 3,600 weekday = 8,752 soldiers*	8,752
Unit Inefficiency Reduction (10%) *8,752 soldiers * 90% = 7,877 soldiers*	7,877
Range Availability Reduction (5%) *7,877 soldiers * 95% = 7,483 soldiers*	7,483
Projected Annual Utilization (total soldiers)	**7,483**

The projected training population for fiscal year (FY) 2000 has approximately 15,115 M16 Rifles authorized to the units. Based on the calculations provided above, approximately 7,483 rifles will be fired on the MRFR annually.

1. Of the 7,483 soldiers projected to fire on the MRFR annually, there are 2,592 weapons assigned to Category I (Infantry) units in the projected training population. MRFR qualification for Category I units requires only 90 rounds, as opposed to the 100 rounds required for Category II (non-Infantry) units. Projected annual utilization for these units is 2,592 soldiers firing 233,280 rounds of 5.56 mm ammunition.

2. The remaining 4,891 soldiers projected to use the MRFR are allocated to Category II units who each fire 100 rounds per qualification. Projected annual utilization for these units is 489,100 rounds of 5.56 mm ammunition.

3. Total combined projected annual utilization is 7,483 soldiers firing approximately 722,380 rounds of 5.56 mm ammunition.

4. The remaining 7,632 M16 rifles projected to be available in the year 2000 will be assigned to soldiers who will not fire at the MRFR. However, these soldiers will continue to use the 25-m alternate training ranges to complete the zeroing phase of annual M16 rifle qualification, and to allow non-Infantry units who do not fire on the MRFR to complete alternate M16 rifle qualification at MMR. Approximately 817,000 rounds of 5.56 mm ammunition is projected to be fired at the 25-m alternate ranges in the year 2000.

Because the MRFR presents targets and simulated engagements at distances not typically used by law enforcement, no civilian law enforcement use of this facility is expected.

Existing Training Activity. There are approximately 15,200 M16 Rifles assigned to soldiers of MAARNG and other active and reserve component units in the region which trained at Camp Edwards in 1994. In addition, civilian law enforcement agencies have used AR15 Rifles (M16s without automatic fire selector) at Camp Edwards in the past. In 1994, M16 rifle qualification took place at MMR on ranges B, C, G, H, I, J, K, KD, N, and P. Approximately 700,000 rounds of 5.56 mm ammunition were fired on these ranges for the purpose of M16 rifle qualification.

These ranges were designed with stationary targets (rather than automated pop-up targets) and clear and open fields of fire that limit the amount of training realism. These alternate ranges do not provide the training realism necessary to train and qualify to current standards. The MRFR is the only facility that meets current Army qualification standards for the M16 rifle.

Siting Requirements. The MRFR requires approximately 24 acres of relatively flat terrain that gently slopes downward and away from the range firing positions to facilitate target placement and allow the soldier to effectively locate and fire upon targets (U.S. Army, 1988a). This downward slope also helps to minimize ricochets. A natural vegetative cover (pitch pine [*Pinus rigida*] and scrub oak [*Quercus ilicifolia*]) is also important so that pop-up targets blend with the surrounding terrain and vegetation, and create a more realistic training environment. As the targets are presented randomly, the soldier must filter out the background and identify, acquire, sight and fire upon the target. Vegetation should be fire resilient, have a slow natural growth rate, and require minimal maintenance.

2.4.2 Multi-Purpose Machine Gun Transition Range

Project Purpose. The MPMR is a live fire range designed to train and qualify M60 Machine Gun teams (two soldiers per team) and soldiers assigned the Squad Assault Weapon (U.S. Army, 1992).

Project Description. The MPMR, if constructed at MMR, would be a six-lane facility based on terrain and safety requirements. Training and qualification on the MPMR includes zeroing the weapon, practice fire, and qualification on the transition range during the day and night. All teams assigned the M60 Machine Gun are required to qualify on this weapon system at least once annually by firing upon a MPMR (U.S. Army, 1984). Soldiers assigned the Squad Assault Weapon are also required to qualify annually on this weapon system (U.S. Army, 1985). MPMR requires approximately 60 acres of land and would include the following facilities:

- a six-lane firing range (each lane fans out from approximately 10 to 100 yards wide as the distance from the firing line increases);
- 150 concrete automated target emplacements located from approximately 100 to 875 yards down range;
- a 120-sf range tower;
- an 800-sf operations/storage building;
- an 800-sf general instructional facility;
- a 120-sf ammunition breakdown building;
- a 760-sf covered dining shelter;
- a 576-sf bleacher enclosure;
- a 192-sf latrine;
- a 700-sf crushed stone parking area; and,
- a crushed stone entrance and service roads (U.S. Army, 1989b).

In addition to the MPMR complex, approximately 1,460 acres (extending into the impact area) will be required as an SDZ.

Based on historic Range Control records, the average military use of Camp Edward's ranges is approximately 137 days per year (see Section 2.4.1). Average time to complete the MPMR course is three hours per weapon system (M60/M249). Assuming 15 available training hours per day and six functioning lanes, this would equate to a daily throughput of 30 soldiers. Annual throughput would be 4,110 soldiers per year. This is the maximum reasonable capacity for the facility. Each soldier is required to fire 336 rounds (M60 or M249 Machine Guns) to complete qualification. This equates to a maximum reasonable throughput of 1,380,960 rounds of ammunition (either 5.56 mm or 7.62 mm).

The projected annual throughput is estimated to be lower. On Sundays, units leave the camp by noon to return to their home armories and clean and store their assigned equipment, which reduces the throughput on the MPMR for that day to two to four soldiers per lane or 12 to 24 soldiers for the entire facility. The projected throughput is then calculated as shown below to derive 2,806 soldiers per year firing the M60 or M249 Machine Guns.

MPMR PROJECTED ANNUAL UTILIZATION

Soldiers firing per lane on Saturday multiplied by number of lanes *5 soldiers * 6 lanes = 30 soldiers*	30
Soldiers firing per lane on Sunday multiplied by number of lanes *2 soldiers * 6 lanes = 12 soldiers*	12
Total soldiers firing per weekend (combined Saturday and Sunday totals) *30 + 12 = 42 soldiers per weekend*	42
Annual total firing on weekends during IDT (occurs 46 weekends/year) *42 soldiers * 46 weekends = 1,932 soldiers*	1,932
Annual total firing on weekdays during AT (occurs 45 weekdays/year) *30 soldiers * 45 weekdays = 1,350 soldiers*	1,350
Total soldiers firing (combines weekend and weekday totals) *1,932 weekend + 1,350 weekday = 3,282 soldiers*	3,282
Unit Inefficiency Reduction (10%) *3,282 soldiers * 90% = 2,954 soldiers*	2,954
Range Availability Reduction (5%) *2,954 soldiers * 95% = 2,806 soldiers*	2,806
Project Annual Utilization (total soldiers)	**2,806**

The projected training population for the model year 2000 has approximately 126 M249 and 972 M60 Machine Guns authorized. Annually, all of these weapons can be fired on the MPMR, and the maximum throughput figures will not be reached. Calculation of the projected annual utilization is as follows:

1. There are 126 M249 5.56 mm Machine Guns in the projected training population. Qualification involves 336 rounds. Allowing for unit inefficiency and range availability, projected annual utilization for this weapon is 108 soldiers firing 36,288 rounds of 5.56 mm ammunition.

2. There are 972 M60 7.62 mm Machine Guns in the projected training population. Qualification involves 336 rounds. Allowing for unit inefficiency and range availability, projected annual utilization for this weapon is 831 soldiers firing 279,216 rounds of 7.62 mm ammunition.

3. Total combined projected annual utilization is 939 soldiers firing approximately 315,504 rounds of 5.56 mm or 7.62 mm ammunition.

Because the MPMR is designed for weapons not typically found in civilian law enforcement, no use by this group is projected.

Existing Training Activity. There are approximately 622 M60 Machine Guns assigned to soldiers of MAARNG, not all of whom train at the Camp. There are also an additional 400 M60 Machine Guns assigned to soldiers of other active and reserve component units in the region which trained at Camp Edwards in 1994. In 1994 there were no M249 5.56 mm Machine Guns in the region. This is a new weapon system being fielded by the year 2000.

Currently, alternate MPMR training is conducted on the following ranges:

M60:	10 m (D, G, H, KD, and O Ranges) - 105,498 rounds of 7.62 mm fired in 1994
M60:	Transition Range (SE and SW Ranges) - 154,947 rounds of 7.62 mm fired in 1994

These existing ranges were designed to meet previous training and qualification requirements that no longer meet current standards. These existing ranges were constructed in clear and open fields of fire that limit the amount of training realism required to meet today's standards. The MPMR is the only facility that meets Army qualification standards for these weapon systems. Consequently, soldiers must train on alternate qualification ranges at MMR or travel to Fort Drum, New York, to train and qualify on an actual MPMR.

Should the MPMR be constructed, only the 10-m ranges will continue in use. Site features of the SE/SW Ranges would be removed and natural vegetation would be allowed to return.

Siting Requirements. With the exception of land area, siting requirements for the MPMR are similar to those discussed for the MRFR. The MPMR requires 60 acres that gently slope downward and away from firing positions, and a vegetative cover to blend into the natural surroundings as much as possible (U.S. Army, 1989b).

2.4.3 Infantry Squad Battle Course

Project Purpose. The ISBC is a live-fire range where infantrymen (on foot) conduct small group tactical movements and attacks on mock enemy positions. The ISBC allows infantry squads to improve tactical proficiency by training under realistic battlefield conditions (U.S. Army, 1992).

Project Description. ISBC training includes tactical fighting operations such as ambush, movement to contact, attacks, retrograde operations, defensive operations, and reconnaissance/security operations.

The ISBC requires approximately 185 acres of land consisting of a pre/post exercise staging area, a range operations/support area, and a training exercise area (U.S. Army, 1990a). The pre/post exercise staging area would include a parking area and service roads, and a troop assembly area. The operations/support area includes the following facilities:

- a 120-sf range control tower;
- a 192-sf latrine;
- an 800-sf operations/storage building;
- an 800-sf general instruction building;
- a 120-sf ammunition breakdown building;
- a 760-sf covered dining shelter; and,
- a 576-sf bleacher enclosure.

The training exercise area consists of five objectives designed to simulate defensive battle positions of an opposing force. These objectives would be located from approximately 200 to 875 yards downrange and would consist of a total of:

- 22 stationary infantry targets;
- six stationary armor targets;
- six armored car moving targets;
- six infantry moving targets, 22 infantry hostile fire simulators;
- 22 night muzzle flash simulators;
- five target objectives;
- 10 mortar simulation devices;
- four machine gun bunkers;
- one observation bunker; and,
- two trenches.

Five unimproved roads extending the length of the range would also be required. In addition to the ISBC complex, approximately 1,465 acres (extending into the impact area) would be required as an SDZ.

Based on historic Range Control records, the average military use of Camp Edward's ranges is approximately 137 days per year (see subsection 2.4.1). Average throughput for the ISBC is projected to be five squads per day which equates to 685 squads annually. This is the maximum reasonable capacity for the facility. The model squad is assigned eight M16 rifles, one M249 machine gun (5.56 mm), and one M60 machine gun (7.62 mm). This typical squad would ideally use 2,000 rounds each of M60/M249 and

2,720 rounds of M16 ammunition (4,720 rounds per squad per exercise) which equates to a maximum reasonable throughput of 3,233,200 rounds of ammunition (a mix of 5.56 mm and 7.62 mm) annually.

The projected annual utilization is estimated to be lower than the maximum reasonable throughput (3,233,200 rounds). There are five infantry battalions (144 squads) in the projected training population. Of these, only 81 squads will actually conduct live fire training annually on the ISBC. The other 63 squads, which are projected to train regularly at an alternate AT site, will not live fire the ISBC during IDT to conserve ammunition for use at their AT site. Ammunition resourcing also impacts the number of rounds each squad will be able to fire on the ISBC. The current projection is that each M16 will have 93 rounds of 5.56 mm ammunition assigned for ISBC training purposes (8 M16 * 93 = 744) for a total of 744 rounds. The M60 Machine Gun and M249 Machine Gun will be limited to 300 rounds each. This reduces the total number of rounds per squad per exercise to 1,344 rounds (from 4,720). Range use was calculated as shown below to derive a projected utilization of 810 soldiers using the ISBC annually.

1. There will be 81 soldiers assigned the M60 machine gun firing an annual total of 24,300 rounds of 7.62 mm ammunition.

2. There will be 81 soldiers assigned the M249 machine gun firing an annual total of 24,300 rounds of 5.56 mm ammunition.

3. There will be 648 soldiers assigned the M16 rifle firing an annual total of 60,264 rounds of 5.56 mm ammunition.

4. The projected annual utilization for the ISBC is estimated to be a total of 810 soldiers firing a combined total of approximately 108,864 rounds of ammunition.

Reductions for unit inefficiency and range availability were not applied to the ISBC utilization projections because these ranges are designed for use by groups rather than individuals. Weapon malfunctions and miscellaneous soldiers not available to train the day of range use does not effect range use or limit the amount of training that can be conducted. In addition, ammunition assigned to soldiers who are unable to train that particular day will be allocated to other soldiers who are present. A range availability factor is also not applied because there are multiple targets available. If a target malfunctions, soldiers can fire on the remaining targets as opposed to the MRFR or MPMR where, if a target malfunctions, a whole practice lane is shut down.

Because the ISBC is designed for weapons not typically found in civilian law enforcement, no use by this group is projected.

Existing Training Activity. Presently, there are 135 infantry squads (approximately 2080 soldiers) in MAARNG and 162 squads (approximately 1860 soldiers) in other New England Army National Guard/Reserve units that potentially require ISBC training. These soldiers currently use the existing Infantry Battle Course (IBC) and other ranges at MMR.

The existing IBC operated at MMR does not meet current design standards for a modern ISBC because it lacks sufficient training area and target automation. In 1994, 40,749 rounds of M16 (5.56 mm), 1,798 rounds of M60 (7.62 mm), and 647 rounds of 40 mm TP ammunition were fired on this range.

Siting Requirements. The ISBC requires approximately 185 acres of relatively flat terrain clear of trees. This terrain should be flat or slope downward for approximately 325 yards away from the staging area; beyond 325 yards, the slope should increase gradually and reach a flat crown area at its highest point of elevation approximately 875 yards downrange. The maximum overall slope throughout the entire complex should not exceed 15 percent. This range should be designed to accommodate existing terrain and vegetative cover as much as possible to provide a realistic training environment.

2.4.4 Military Operations on Urbanized Terrain-Military Assault Course

Project Purpose. The MOUT-MAC is a live-fire range designed to train individuals or small groups on specific techniques used in urban combat situations (U.S. Army, 1992).

Project Description. MOUT techniques include, but are not limited to, clearing and entering a building, selecting and preparing individual and crew-served weapon positions, and moving in urban terrain (U.S. Army, 1993). MOUT training is required for military police (MP), infantry, and all soldiers whose mission may include urban settings. The MOUT-MAC facility requires approximately 10 acres of land, and would consist of a pre/post exercise staging area and the actual training course. The pre/post exercise staging area consists of a 700-sf crushed stone parking lot, an outdoor classroom, and a preparation area for staging equipment. The training course is a permanent facility designed to simulate the buildings and infrastructure of a typical town or city. This facility would include six training buildings, an underground sewer pipe network, and an inert grenade launcher range. The six training buildings include:

- a 4,608-sf Urban Defense Building;
- a 576-sf Vault and Fight Facility;
- an 810-sf Clearing Techniques Building;
- a 960-sf facility called Destiny Doorway;
- a 1,792-sf facility called Dodge City; and,
- a 1,938-sf Grenade House (U.S. Army, 1988b).

This complex will also include 263 linear feet of underground sewer pipe. Other ancillary facilities include target systems, a 336-sf latrine, five observation towers, and earthen safety berms. In addition to the MOUT-MAC complex, approximately 820 acres (extending into the impact area) would be required as an SDZ. Approximately 18 acres would be required as the SDZ for the Grenade House.

Based on historic Range Control records, the average military use of Camp Edward's ranges is approximately 137 days per year (see Section 2.4.1). Average daily throughput is projected to be 10 squads (100 soldiers) per day which equates to 1,370 squads (13,700 soldiers) annually. This is the maximum reasonable capacity for the facility. A typical squad iteration would ideally use 800 rounds of M60/M249 and 800 rounds of M16 ammunition (1,600 total rounds per squad per exercise). This equates to a maximum reasonable throughput of 2,192,000 rounds of ammunition (a mix of 5.56 mm and 7.62 mm) annually.

The projected annual utilization is estimated to be lower. There are five infantry battalions in the projected training population with 144 squads, two Combat Engineer Battalions with a projected training population of 54 squads, and 10 MP Companies with 120 squads. This is a total of 318 squads (3,180 soldiers). The model squad is equipped with eight M16 rifles (5.56 mm), one M249 machine gun (5.56 mm), and one M60 machine gun (7.62 mm).

Of the possible 318 squads, only 81 Infantry squads and 108 MP squads regularly conduct AT at Camp Edwards. The 81 Infantry squads are authorized to use both live and blank ammunition at Camp Edwards while the 108 MP squads are only authorized to use blank ammunition. In addition, ammunition resourcing impacts the number of rounds each squad will be able to fire on the MOUT-MAC. The modeled projection for live ammunition is each M16 will be allotted 93 rounds of 5.56 mm ammunition (8 M16 * 93 = 744) for a total of 744 rounds. The M60 Machine Gun and M249 Machine Gun will be limited to 200 rounds each. This reduces the total number of rounds per squad to 1,144 rounds (versus 1,600). The remaining 129 squads do not train regularly at Camp Edwards and are projected to use the MOUT-MAC facility during IDT only, and without ammunition (live or blank).

A unit efficiency and range availability factor was not included in these projections for the same reasons described for the ISBC (see Section 2.4.3). Range use was calculated as shown below to derive a projected annual utilization of 810 soldiers using live ammunition on the MOUT-MAC annually.

1. There will be 81 soldiers assigned the M60 machine gun firing an annual total of 16,200 rounds of 7.62 mm ammunition.

2. There will be 81 soldiers assigned the M249 machine gun firing an annual total of 16,200 rounds of 5.56 mm ammunition.

3. There will be 648 soldiers assigned the M16 rifle firing an annual total of 60,264 rounds of 5.56 mm ammunition.

4. The projected annual utilization for the MOUT-MAC is estimated to be a total of 810 soldiers firing a combined total of approximately 92,664 rounds of ammunition.

In addition to the live ammunition described above, various units will also use M16 blank ammunition on the MOUT-MAC. Each Infantry squad conducting AT at Camp Edwards will use a total of 288 rounds, and each MP Squad will fire a total of 130 rounds. Total blank ammunition fired is estimated to be 81 infantry squads $*$ 288 rounds (23,328) + 108 MP squads $*$ 130 rounds (14,040) = 37,368 rounds.

Civilian law enforcement is expected to use portions of the MOUT-MAC for its training needs. Based on MAARNG telephone surveys of New England law enforcement agencies, additional interest was expressed in using the facility. Civilian law enforcement is estimated to double its current total man-day use of Camp Edwards due to the presence of the MOUT-MAC and its sister facility the MOUT-CTF. In 1994 civilian law enforcement use of the camp was 3,346 man-days. Fifty percent of the increase is projected to be at the MOUT-MAC (1,673 man-days).

Existing Training Activity. A MOUT-MAC facility does not currently exist at MMR. Currently, there are 4,911 Massachusetts National Guard/Reserve personnel throughout New England requiring this training who travel to Fort Pickett, Virginia, or to Fort Drum, New York. However, traveling to Fort Pickett significantly reduces available training time and exceeds the maximum travel requirements specified by NGB Policy (see Section 2.4). In addition, Fort Drum is the home of the 10th Mountain Division which is part of the Rapid Deployment Force. The Rapid Deployment Force receives the highest priority for training and readiness. In addition, New York and Pennsylvania National Guard Units regularly use MOUT facilities at Fort Drum. MOUT facilities may not always be available for use by units other than those described above.

Siting Requirements. MOUT-MAC requires approximately 10 acres of land. Half of this area should be vegetated naturally to provide concealment during staging and maneuvering. The actual MOUT-MAC complex would be selectively cleared of vegetation to promote realism and reduce maintenance costs. The site should be relatively flat and not have a maximum overall slope of greater than 15 percent. In addition, MOUT-MAC should be located in proximity to the proposed MOUT-CTF facility because training at these two facilities is sequential.

2.4.5 Military Operations on Urbanized Terrain-Collective Training Facility, (Platoon)

Project Purpose. MOUT-CTF is the continuation of urban combat training. Individual training skills and experience gained at MOUT-MAC are integrated with the urban tactics such as raids, ambushes, and underground reconnaissance required by small or large groups (U.S. Army, 1993). MOUT-CTF is not a live-fire range.

Project Description. This facility allows squads, platoons, companies, or battalions to train on a variety of missions in an urban environment. The MOUT-CTF proposed for MMR would be designed to accommodate platoon-sized units. MOUT-CTF is designed to simulate a town that has been attacked complete with roads, buildings, infrastructure, and rubble structures (U.S. Army, 1988b). MOUT-CTF training is required for MP, infantry, and all soldiers whose mission may include urban settings. The proposed MOUT-CTF, designed to accommodate a platoon (36 to 50 soldiers), requires approximately eight acres of land, and consists of the following 17 facilities:

- a 9,408-sf city hall (three-story);
- a 7,680-sf apartment building (three-story);
- a 4,480-sf office building (two-story);
- a 4,608-sf business building (two-story);
- a 6,400-sf townhouse (two-story);
- an 8,240-sf school building (two-story);
- a 1,152-sf bank building (single-story);
- a 1,025-sf residence (single-story);
- a 4,150-sf warehouse (single-story);
- three 1,025-sf rubble residences (single-story);
- a 2,240-sf rubble office building (single-story);
- two 2,900-sf rubble townhouses (single-story);
- a 576-sf rubble service station; and,
- four 400 linear-foot sewer culverts (U.S. Army, 1988b).

Ancillary facilities include a crushed stone parking area and service roads, two support facilities, and a latrine. An SDZ would not be required for this complex because all munitions used would either be blank or inert, as discussed below.

Based on historic Range Control records, the average military use of Camp Edward's ranges is approximately 137 days per year (see Section 2.4.1). Average throughput is projected to be one company (100 soldiers) per day equating to 137 companies or 13,700 soldiers annually. This is the maximum reasonable capacity for the facility. A typical company would ideally use 3,600 rounds each of M60 and M249 (7.62 mm and 5.56 mm, respectively), 39,600 rounds of M16 (5.56 mm) and 1,000 rounds of .50 caliber ammunition (a total of 44,200 rounds per company per exercise). All ammunition used at the MOUT-CTF is blank. This equates to a maximum reasonable throughput of 6,548,600 rounds of ammunition (a mix of 5.56 mm, 7.62 mm and .50 caliber blank) annually.

The projected annual throughput is estimated to be lower. There are five infantry battalions in the projected training population with 16 companies, two Combat Engineer Battalions with a projected training population of six companies and 10 MP Companies.

Of these companies, only nine Infantry Companies (900 soldiers) and nine MP Companies (900 soldiers) will actually conduct blank fire training annually on the MOUT-CTF. This is the projected annual utilization for the MOUT-CTF. As for ISBC and MOUT-MAC, a unit efficiency and range availability factor was not included in these projections. The remaining companies, which are projected to conduct AT, will not blank fire at the MOUT-CTF during IDT in order to conserve ammunition resources for use at their AT site.

Ammunition resourcing also impacts the number of rounds each squad will be able to fire on the MOUT-CTF.

Weapon Type	**Infantry Company**	**Military Police Company**
M16 Rifle (5.56 mm)	72 rounds * 100 weapons = 7,200	26 rounds * 120 weapons = 3,120
M249 Machine Gun (5.56 mm)	320 rounds * 6 weapons = 1,920	(Not Authorized Weapon)
M60 Machine Gun (7.62 mm)	320 rounds * 2 weapons = 640	80 rounds * 12 weapons = 960
.50 caliber Machine Gun	(Not Authorized Weapon)	80 rounds * 1 weapon = 80
Total	9,760 * 9 = 87,840 rounds	4,160 * 9 = 37,440 rounds

This reduces the total estimate of blank rounds to be fired on the MOUT-CTF from 6,055,400 to 125,280 rounds (87,840 + 37,440).

Civilian law enforcement is expected to use portions of the MOUT-CTF for its training needs. Based on MAARNG phone polls of New England law enforcement agencies, some additional interest was expressed in using the facility. Civilian law enforcement is estimated to double its current total man-day use of Camp Edwards due to the presence of the MOUT-CTF and its sister facility the MOUT-MAC. In 1994, civilian law enforcement use of the camp was 3,346 man-days. Fifty percent of the increase is projected to be at the MOUT-CTF (1,673 man-days).

Existing Training Activity. A MOUT-CTF facility does not exist at MMR. Currently, there are 4,911 Massachusetts National Guard/Reserve personnel throughout New England requiring this training who travel to Fort Pickett, Virginia; however, traveling to Fort Pickett significantly reduces training time and exceeds the maximum travel requirements specified by NGB Policy (see Section 2.2). As discussed under MOUT-MAC above, MOUT facilities recently constructed at Fort Drum, New York, would not always be available for use by the Massachusetts National Guard.

Siting Requirements. MOUT-CTF requires approximately eight acres of land. The terrain should be relatively flat and well drained, and cleared of all vegetation. MOUT-CTF also requires approximately 200 to 300 acres of vegetated/forested land surrounding the CTF. This area would not be developed but would provide an area for undetected staging, maneuvering, and tactical approach to the complex. Because the intent of MOUT-CTF is to train how to attack and defend a small town or village, the land surrounding the village should have well-established roads or trails, and dense vegetation and trees (approximately 20 to 40 feet [ft] tall). MOUT-CTF should be located in proximity to the proposed MOUT-MAC facility because training at these facilities is sequential.

2.5 Cantonment Project Descriptions

This section provides an overview of the proposed MAARNG Cantonment Project, UTES, and the four proposed MAANG Cantonment Projects: Airfield Control Tower; AGU Facility; Fire Station; and Environmental Facility. This discussion includes project descriptions, and descriptions of existing activities, and specific siting requirements. Table 2-2 provides a summary of the Cantonment Projects. The project description information presented below was provided by MAARNG and MAANG.

Table 2-2
Cantonment Project Description Summary

Proposed Project	Acreage Required	Existing Personnel Assigned	Projected Personnel Assigned
UTES	8	44	44
Control Tower	<1	5	5
AGU	<1	175	175
Fire Station	<1	25	25
EnvironmentalFacility	<1	23	23

2.5.1 Unit Training Equipment Site

Project Purpose. To provide sufficient maintenance and vehicle storage space for the efficient maintenance and storage of MAARNG tactical and engineering vehicles and training equipment assigned to MMR.

Project Description. This proposed project involves either renovating or replacing the existing UTES at MMR. UTES is an industrial facility designed to provide a modern maintenance and storage facility for MAARNG tactical and engineering vehicles and equipment authorized at MMR. Vehicles and equipment stored and maintained at MMR are allocated to transient personnel rather than requiring the transport of vehicles and equipment from home armories to MMR. The proposed UTES facility would be designed to meet the requirements of the currently authorized vehicles and personnel (see Existing Activity below).

The proposed UTES would include a Primary Maintenance Building and associated ancillary facilities. The Primary Maintenance Building would be a one-story, approximately 34,000-sf steel and concrete facility designed specifically for the maintenance of both wheeled and tracked vehicles, and other military equipment assigned to the site. This facility includes shop areas for the following activities: general maintenance; vehicle body work and repair; welding; painting; communications and electronic equipment repair; and weapons maintenance. Equipment and supply storage, administrative/office space, and personnel areas such as showers and lavatories would also be included. Associated ancillary facilities include: a 3,000-sf Maintenance Storage Building to store spare parts; a 400-sf flammable materials storage building; and a 500-sf controlled waste handling building to store shop-generated hazardous waste awaiting pickup for off-post disposal. Other ancillary facilities include two exterior lubrication and inspection racks; two loading ramps; a fuel storage and dispensing area; an equipment washrack; approximately 35,000-sf (0.5 acre) of concrete rigid paving for access aprons to work bays, inspection racks, loading ramps, and secondary containment; approximately 34,200-sf (0.8 acre) of bituminous flexible paving for privately owned vehicle (POV) parking, access to aprons and access roads to the site; and approximately 239,000-sf (5.5 acres) of crushed stone for military vehicle storage areas, access roads and unit equipment staging areas.

Existing Activity. The existing maintenance facility supports 44 personnel and the storage, maintenance, and/or repair of 188 tracked vehicles, 64 wheeled vehicles, and 22 trailers. These activities are conducted at the existing UTES facility located on the former Boeing Michigan Aeronautical Research Center (BOMARC) Missile Complex. This location does not effectively support the UTES mission because adequate maintenance and storage space is not available. The existing building (a former missile maintenance facility) was not designed for vehicle maintenance and the building configuration does not provide functional work space for efficient operation. Existing vehicle bays are narrow (26 ft by 30 ft; 780-sf) and do not allow vehicles to be pulled or towed through. A typical UTES maintenance bay is approximately 32 ft by 32 ft (1,024-sf). Many existing vehicle types cannot be maintained indoors because the existing facility is too small. In most instances, the roof is too low and prevents the full elevation of radar, missile, or artillery systems. Consequently, this maintenance must be conducted outdoors, even in adverse weather conditions, throughout the year. This complex is also located within the boundary of IRP Site CS-10 (BOMARC Missile Complex) and may cause operational constraints if the BOMARC Complex is to be demolished as part of ongoing remediation efforts.

Siting Requirements. The location should support the maintenance and issue of military equipment to units that train at MMR. It should also provide sufficient facilities and storage space to adequately and efficiently maintain the vehicles, equipment, and personnel currently assigned to MMR. The maintenance facility should be large enough so that work bays can be provided for every three mechanics assigned to MMR, and designed so that vehicles can drive through each work bay. The building should also be designed so that maintenance on each vehicle type assigned to MMR can be conducted with the doors closed. The UTES should be located close to the training area in order to minimize fuel consumption, driving distance/time to and from the training area, and the use of existing paved roads by tracked vehicles. Other criteria include proximity to existing utility services, vehicle washrack, fuel dispensing site, existing parking areas and roads which lead to the training area, and minimizing current or future conflicts with ongoing remediation efforts being conducted under the IRP.

2.5.2 Airfield Control Tower

Project Purpose. To provide a modern, round-the-clock centralized point of control and observation for all aircraft and vehicles utilizing the Otis ANGB airfield at MMR.

Project Description. The proposed Airfield Control Tower would consist of one 530-sf, five-story control tower and air traffic control cab. The air traffic control cab is the portion of the tower which houses the air traffic controllers and equipment. This new facility would allow for the expansion and upgrade of air traffic control equipment. A larger modern control cab is necessary to accommodate the additional updated equipment required for today's operations. This new equipment would include modern control consoles, weather and lighting controls, and radio communication equipment. The control tower would be designed to accommodate five air traffic controllers and associated equipment. If a new tower were constructed, the existing tower would be demolished.

Existing Activity. The existing control tower was constructed in 1956, has only three control stations, and no longer meets current FAA standards for size, technology, and safety. The existing tower also does not meet current electrical and fire codes, does not have adequate heating and plumbing, and does not have a secondary means of egress in case of an emergency. Additionally, the existing cab protrudes into an aircraft flight safety zone. The flight safety zone is an area of three-dimensional space extending outward and upward from the runway centerline in which no permanent or infrangible structures may exist (MAANG, 1996).

Siting Requirements. The proposed Airfield Control Tower requires an area on the airfield that provides a clear line of sight to the entire airfield and complies with FAA and AICUZ guidelines.

2.5.3 Aircraft Generation Unit Facility

Project Purpose. To provide a facility, separate from Building 158 (Main Hangar), for the efficient operation of the AGU.

Project Description. The proposed AGU Facility would consist of approximately 18,000-sf of hangar, workshop and office space for the minor pre-flight maintenance and repair to MAANG aircraft assigned to MMR. Pre-flight maintenance activities include diagnostic testing, fluids and systems inspection, and other minor repair immediately prior to taxiing for takeoff. The number of MAANG personnel or aircraft currently maintained at MMR would not increase as a result of this proposed project.

Existing Activity. Currently, the activities and functions of the AGU and associated 175 personnel are co-located with the Consolidated Aircraft Maintenance Section (major repair section) in Building 158. This often results in one organization interrupting the functions and operations of the other because of the shared space. The new facility would provide for the division of these two separate functions and allow for increased efficiency of both operations.

Siting Requirements. The AGU Facility requires a central location on the existing flightline near the parking apron, and other aviation maintenance and administrative facilities.

2.5.4 Fire Station

Project Purpose. To provide a modern facility with adequate berthing, classroom, and indoor vehicle parking areas for the MAANG Fire Department personnel and equipment. A modern Otis ANGB fire station will be compatible with local community fire stations and allow for better support in mutual aid responses.

Project Description. The proposed Fire Station would involve constructing a new, 25,000-sf, two-story airfield crash and structure fire station or building a 2,900-sf, two-story addition to the existing fire station. This new structure would consist of the following rooms: an Apparatus Room with drive-through bays for 14 vehicles (13,000-sf); an Alarm Communications Center (350-sf); Training Facilities (1,000-sf); Living Quarters (3,500-sf); and a Maintenance, Storage, and Support Center for fire equipment (4,350-sf). The number of personnel and equipment currently assigned to the fire station would not increase. Should a new fire station be constructed, the existing fire station would be demolished.

The Fire Station Addition would consist of a 1,800-sf vehicle bay for the storage of two fire department vehicles, a 750-sf classroom/training room, and an expansion of the alarm control console room to 350-sf. As in the new fire station described above, the number of personnel currently assigned to the fire station would remain.

Existing Activity. The existing fire station is inadequate in size and usable areas. Due to the lack of adequate vehicle bays and classroom space, several firefighting and rescue vehicles are parked outside in adverse weather conditions, and classes are taught in the dining and berthing areas of the fire station.

The existing fire station is in non-compliance with many national and federal occupational life and safety codes including National Fire Protection Association Life and Safety Codes for Firefighters, National Electric Codes, Occupational Safety and Health Administration Codes, and USAF Occupational Health and Safety Codes. These violations include, but are not limited to, issues regarding separation between vehicle exhaust and berthing area, decontamination of fire fighter protective clothing, training facilities, equipment maintenance and medical supply storage.

In addition, the current alarm control center is not adequate to house the new mandatory alarm control consoles including an Emergency 911 System and related ancillary equipment (computers, radios, telephones, remote video equipment, etc.).

There are currently 25 full-time personnel assigned to the Fire Station per shift.

Siting Requirements. The proposed new Fire Station must be located in the vicinity of the existing fire station due to its proximity to airfield operations, and shortest emergency response time to facilities within the airfield and cantonment areas of MMR. In addition, adequate parking and utility access is required.

2.5.5 Environmental Facility

Project Purpose. To consolidate the personnel and environmental functions of MAANG at MMR.

Project Description. The proposed 8,000-sf Environmental Facility would include office and administrative space for the MAANG environmental management, and the IRP staff. The proposed facility would provide for the consolidation and improved efficiency of these functions and consist of offices, laboratories, lavatories, a break room, a conference room, and storage rooms. Paved driveways, a parking lot, and sidewalks would also be included. The Environmental Facility would consolidate the operations and equipment of approximately 23 personnel within MMR.

Existing Activity. Currently, the environmental functions at MMR and associated 23 personnel are in separate facilities located throughout the cantonment area.

Siting Requirements. The proposed Environmental Facility would require constructing the facility in a centralized location having public access as well as access to existing utility services and adequate parking.

2.6 Alternatives

As discussed in Section 2.0, these proposed projects have been separated into five Range Projects and five Cantonment Projects for ease of analysis and presentation. Subsequently, the alternatives at MMR for each of the proposed projects have been similarly separated.

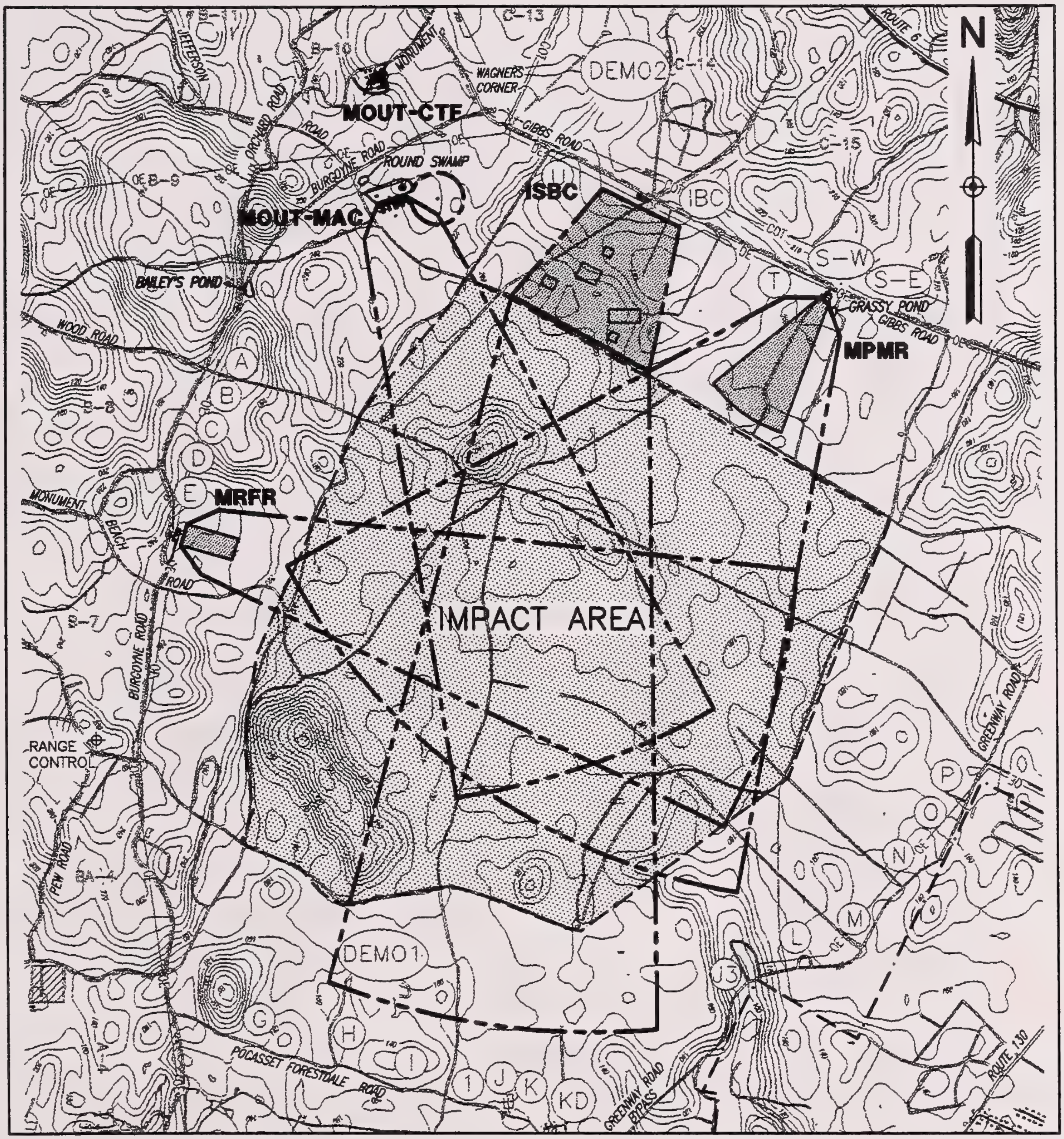
After considering the screening criteria presented in Section 2.3, a number of alternatives for each of the Range Projects remained for environmental analysis. Although the Range Projects are somewhat independent of each other (with the exception of the MOUT facilities), their orientation around the impact area is not. Each of the proposed Range Project alternatives needs to fit within a range configuration so as to maximize safety and minimize conflicts with the use of other ranges. In addition to discussing alternative locations for each range project, this EIS/EIR presents three proposed range configurations or scenarios (excluding no action) where one of each of the Range Projects is grouped together to fit within the existing range configuration. Other configurations of these proposed projects are possible; however, other configurations would not maximize safety and minimize range conflicts.

The Cantonment Projects and their alternatives are mutually exclusive and independent such that they are presented as individual project alternatives (see Section 2.6.2).

For the Range Projects, Scenario 1 represents the Preferred Alternative for all Range Projects. For the Cantonment Projects, Alternative 1 represents the Preferred Alternative for each project.

2.6.1 Range Project Alternatives

After evaluation criteria were applied to each of the individual range project alternatives, three reasonable alternative locations for each of the range projects, except for MOUT-CTF which has two, remained (in addition to no action). Each of the scenarios presented below (Figures 2-5 through 2-7) introduce a possible orientation of the five proposed range projects and represent the alternatives for the Range Projects to be analyzed in this document. Table 2-3 provides a comparison of Range Projects in terms of the screening criteria discussed in Section 2.3. Each of the alternatives presented below meet the following criteria; mission fulfillment; current training standards; logistics; range



LEGEND

▨	PROPOSED RANGE AREA
— — —	PROPOSED SURFACE DANGER ZONE LIMITS
— · —	INSTALLATION BOUNDARY
Ⓐ	EXISTING RANGE
①	EXISTING MORTAR POSITION
▨	EXISTING AMMUNITION SUPPLY POINT (ASP)
A-4	EXISTING TRAINING AREA
— COT —	EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION
— OE —	EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

FIGURE DOES NOT INDICATE ALL GUN AND MORTAR POSITION LOCATIONS.

0 1500 3000 FEET

1"=3000'

Source: Camp Edwards Training Site

RANGE PROJECT SCENARIO 1

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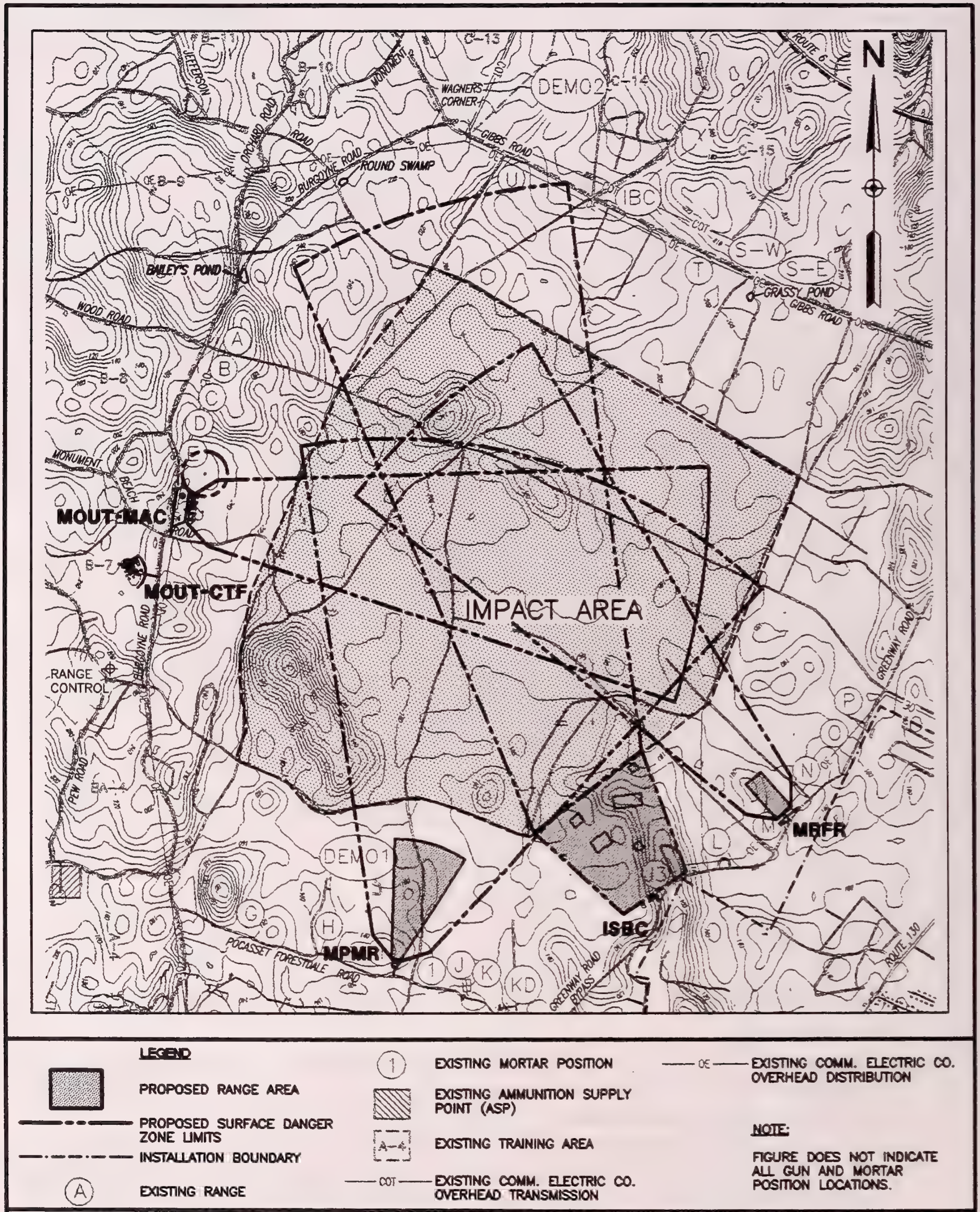
Figure 2-5



Source: Camp Edwards Training Site

RANGE PROJECT SCENARIO 2

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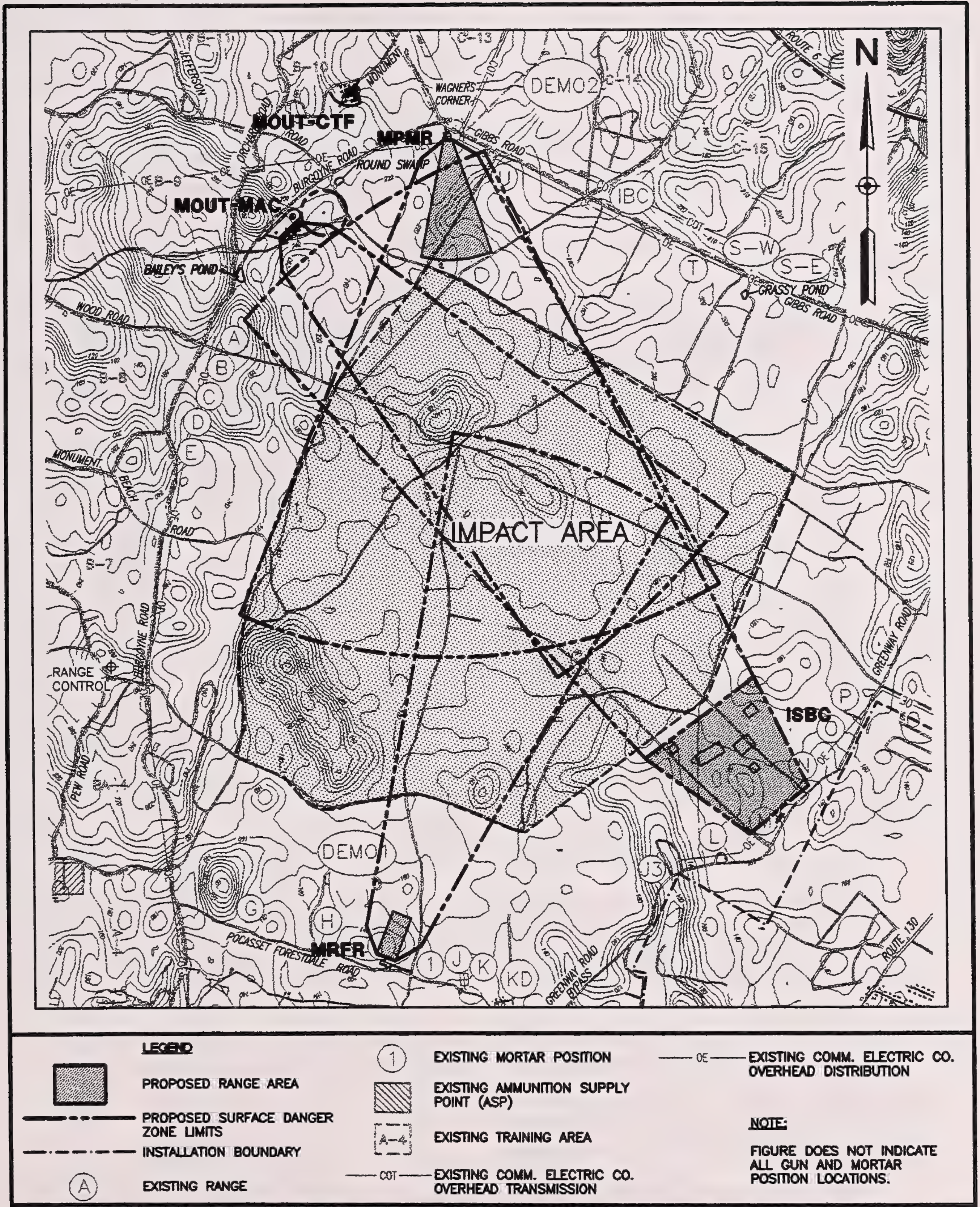
Figure 2-6



0 1500 3000 FEET

1"=3000'

Source: Camp Edwards Training Site

RANGE PROJECT SCENARIO 3

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Figure 2-7

condition; availability; and avoidance of natural and cultural resources. For ease of comparison, only those criteria which differentiate the alternatives are presented in Table 2-3.

Table 2-3
Comparison of Range Alternatives

	Topography	Vegetation	Utility Access	Existing Road Access	Range Conflict	Use of Existing Range	Distance from Off-post Residences
MRFR							
Scenario 1	✓	✓	✓	✓	✓		✓
Scenario 2		✓	✓	✓		✓	
Scenario 3				✓		✓	
MPMR							
Scenario 1	✓	✓	✓	✓	✓	✓	✓
Scenario 2		✓		✓		✓	
Scenario 3				✓			✓
ISBC							
Scenario 1	✓	✓	✓	✓	✓ *	✓	✓
Scenario 2		✓	✓	✓			
Scenario 3		✓	✓	✓		✓	
MOUT-MAC							
Scenario 1	✓	✓	✓	✓	✓		✓
Scenario 2		✓	✓	✓	✓		✓
Scenario 3		✓	✓	✓	✓		✓
MOUT-CTF							
Scenario 1	✓	✓	✓	✓	✓		✓
Scenario 2	✓	✓	✓	✓	✓		✓

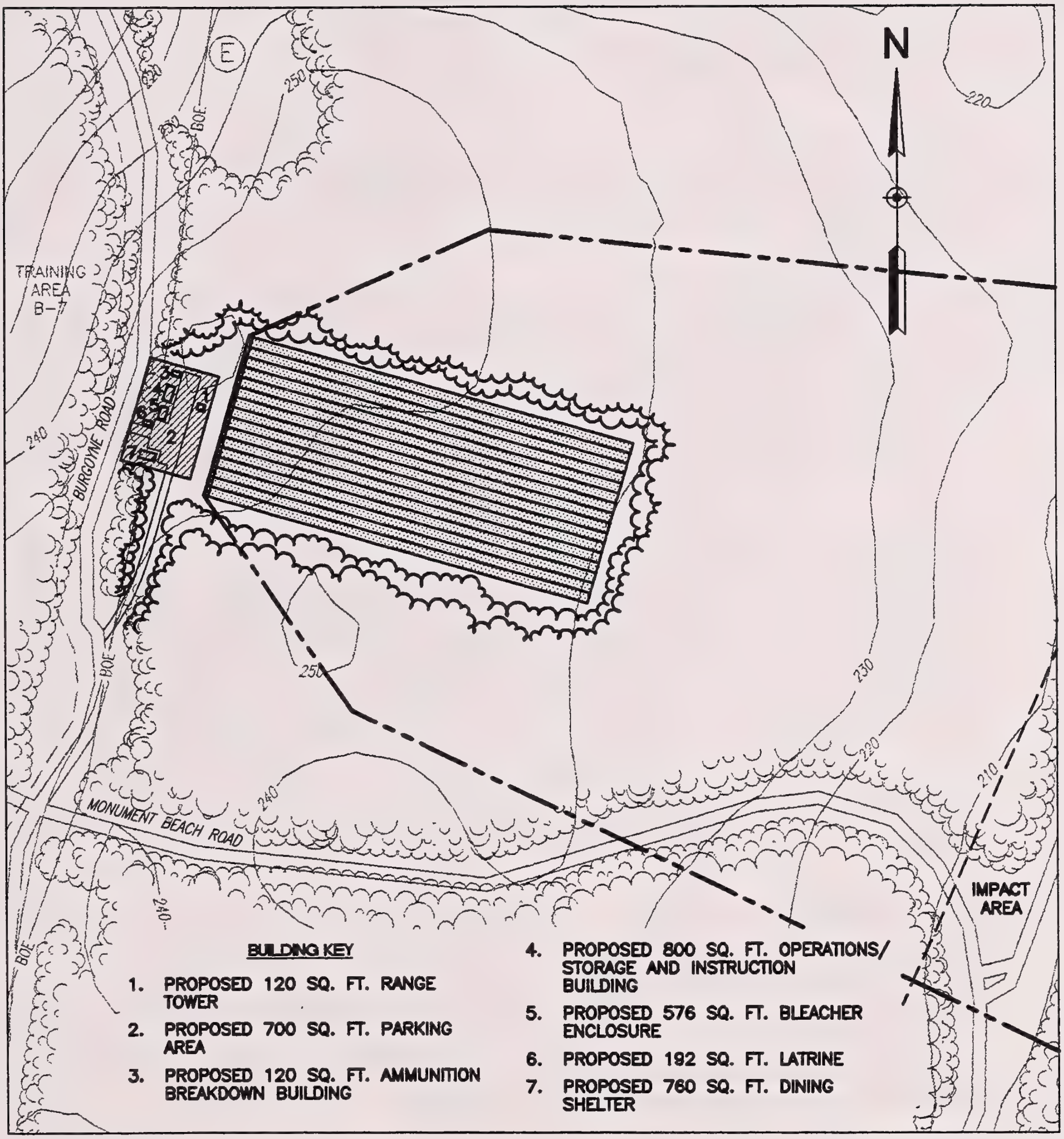
Notes: ✓ Indicates the alternative meets minimum project/screening requirements.
✓ Indicates that no potential conflicts will exist under Range Conflict category.
* Potentially denies the use of certain munitions only on KD range.

This document assumes limited vegetation clearing and site grading associated with implementation of the proposed project alternatives. Actual design of the proposed Range Projects will accommodate existing site features as much as possible to provide training realism and minimize potential impacts to the environment (e.g., soil erosion).

Construction of the proposed range projects will include selective clearing of the project sites, thereby retaining natural vegetation around the support facilities and between firing lanes.

2.6.1.1 Range Scenario 1

Modified Record Fire Range. In Range Scenario 1, the MRFR would be constructed immediately east of Burgoyne Road, north of Monument Beach Road, and south of E Range (Figure 2-8). This site provides gently sloping terrain and would not require topographic alteration. This location also provides a fire resilient vegetative cover (pitch



BUILDING KEY

1. PROPOSED 120 SQ. FT. RANGE TOWER
2. PROPOSED 700 SQ. FT. PARKING AREA
3. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
4. PROPOSED 800 SQ. FT. OPERATIONS/ STORAGE AND INSTRUCTION BUILDING
5. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
6. PROPOSED 192 SQ. FT. LATRINE
7. PROPOSED 760 SQ. FT. DINING SHELTER

LEGEND

░	PROPOSED RANGE AREA	— — — —	IMPACT AREA BOUNDARY
▨	PROPOSED SUPPORT AREA	⌒⌒⌒	PROPOSED WOODED AREA
		⌒⌒⌒	EXISTING WOODED AREA
— - - —	PROPOSED SURFACE DANGER ZONE LIMITS	Ⓐ	EXISTING RANGE
———	PROPOSED FIRING LANES	——BOE——	EXISTING BASE OVERHEAD ELECTRIC DISTRIBUTION

NOTE:

PROPOSED RANGE AREA APPROXIMATELY 9.5 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

0 200 400 FEET

1"=400'

Source: Camp Edwards Training Site

MODIFIED RECORD FIRE RANGE SCENARIO 1

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Figure 2-8

pine and scrub oak); however, this site is not currently a firing range and subsequently would require some clearing or topping during construction for sighting the range support structures, firing lanes, target placements, and line-of-sight between the firing lanes and targets.

Alteration to vegetation between firing lanes and around target placements will be avoided as much as possible to meet tactical training requirements. This site provides immediate accessibility to existing overhead utilities and a double lane access road (Burgoyne Road) adjacent to the site. This location would not impact other existing range use and is not proximal to any known protected natural or cultural resources. This site is on the western side of the impact area away from off-site residential housing. This alternative location is the same as ISBC-Scenario 3 (see Section 2.6.1.3).

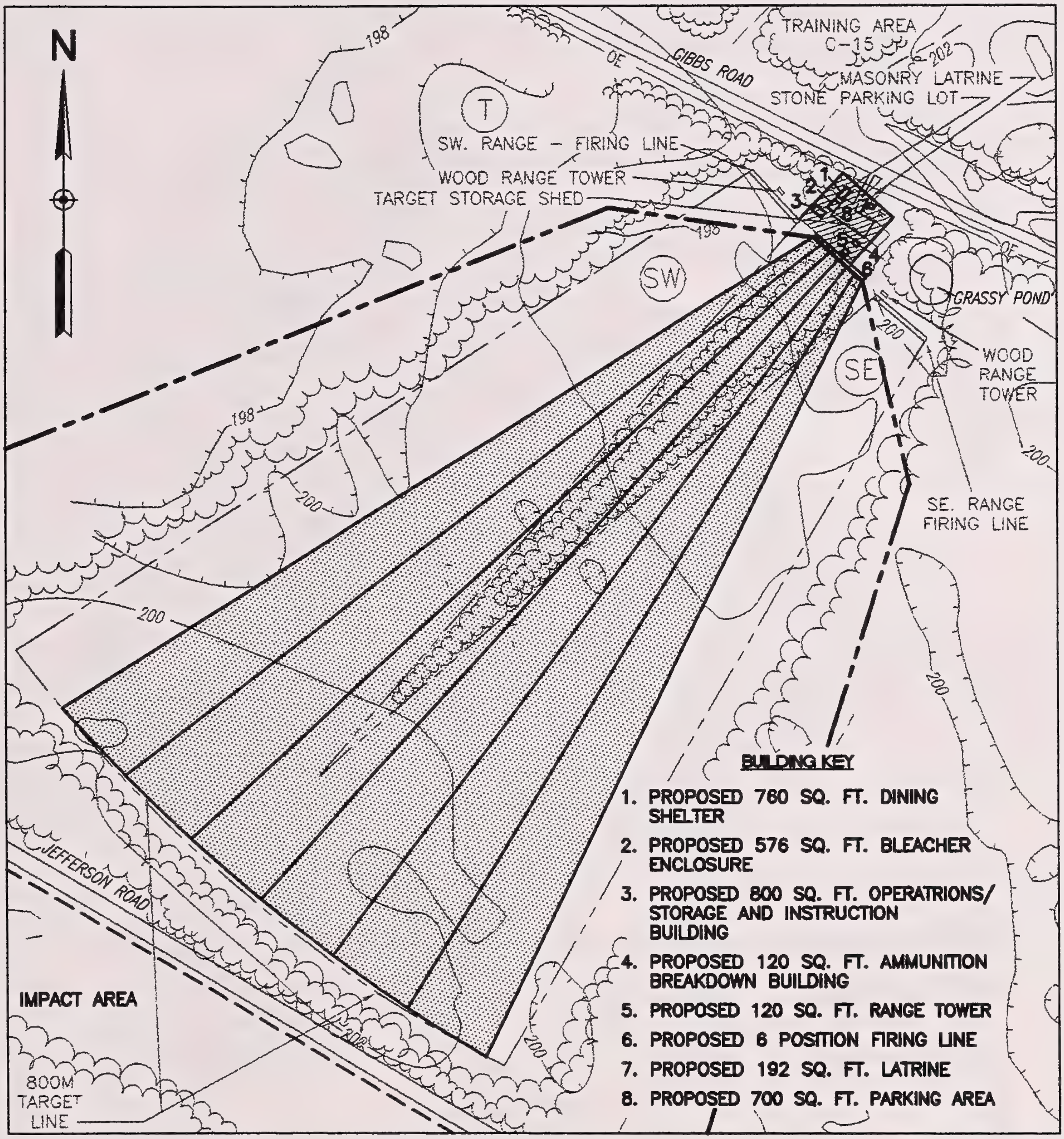
Multi-Purpose Machine Gun Transition Range. This alternative would involve converting SE and SW Machine Gun Ranges into the MPMR (Figure 2-9). Both topography (generally flat and sloping downward) and natural vegetative cover (pitch pine and scrub oak) at SE and SW meet project requirements; however, some clearing between SE and SW ranges would be necessary. As stated above, alteration to vegetation between firing lanes and around target placements will be avoided as much as possible to meet tactical training requirements.

This location is accessible via Gibbs Road, and electrical power is already established. This site would not conflict with other existing range use, and is not near off-post residential housing nor any known protected natural or cultural resources.

Infantry Squad Battle Course. This alternative would involve converting the existing IBC Range into the ISBC (Figure 2-10). This location provides the vegetative and topographic requirements; however, some clearing would be necessary during construction. A well-established road network (Gibbs Road and unimproved trails) exists, and power access is also available. This location is not near off-post residential housing nor any known protected natural or cultural resources. There would be no range conflicts except when certain munitions are used at KD Range.

Military Operations on Urbanized Terrain-Military Assault Course. This scenario would involve constructing the MOUT-MAC SE of the intersection of Jefferson and Burgoyne Roads (Figure 2-11). This location provides the necessary vegetation and topography; however, the entire project area would require clearing for construction.

Some vegetation would be re-established to create the required tactical effects. The location is accessible via Jefferson and Burgoyne Roads and electrical power is accessible. This location would not pose conflicts with the use of other ranges, is not near any known



BUILDING KEY

1. PROPOSED 760 SQ. FT. DINING SHELTER
2. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
3. PROPOSED 800 SQ. FT. OPERATRIONS/ STORAGE AND INSTRUCTION BUILDING
4. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
5. PROPOSED 120 SQ. FT. RANGE TOWER
6. PROPOSED 6 POSITION FIRING LINE
7. PROPOSED 192 SQ. FT. LATRINE
8. PROPOSED 700 SQ. FT. PARKING AREA

LEGEND

░ PROPOSED RANGE AREA

▨ PROPOSED SUPPORT AREA

— - - — PROPOSED SURFACE DANGER ZONE BOUNDARY

—— PROPOSED FIRING LANES

– – – – – IMPACT AREA BOUNDARY

⌒⌒⌒ EXISTING WOODED AREA

Ⓐ EXISTING RANGE

—OE— EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

PROPOSED RANGE AREA APPROXIMATELY 61 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

0 250 500 FEET

1"=500'

Source: Camp Edwards Training Site

MULTI-PURPOSE MACHINE GUN TRANSITION RANGE SCENARIO 1

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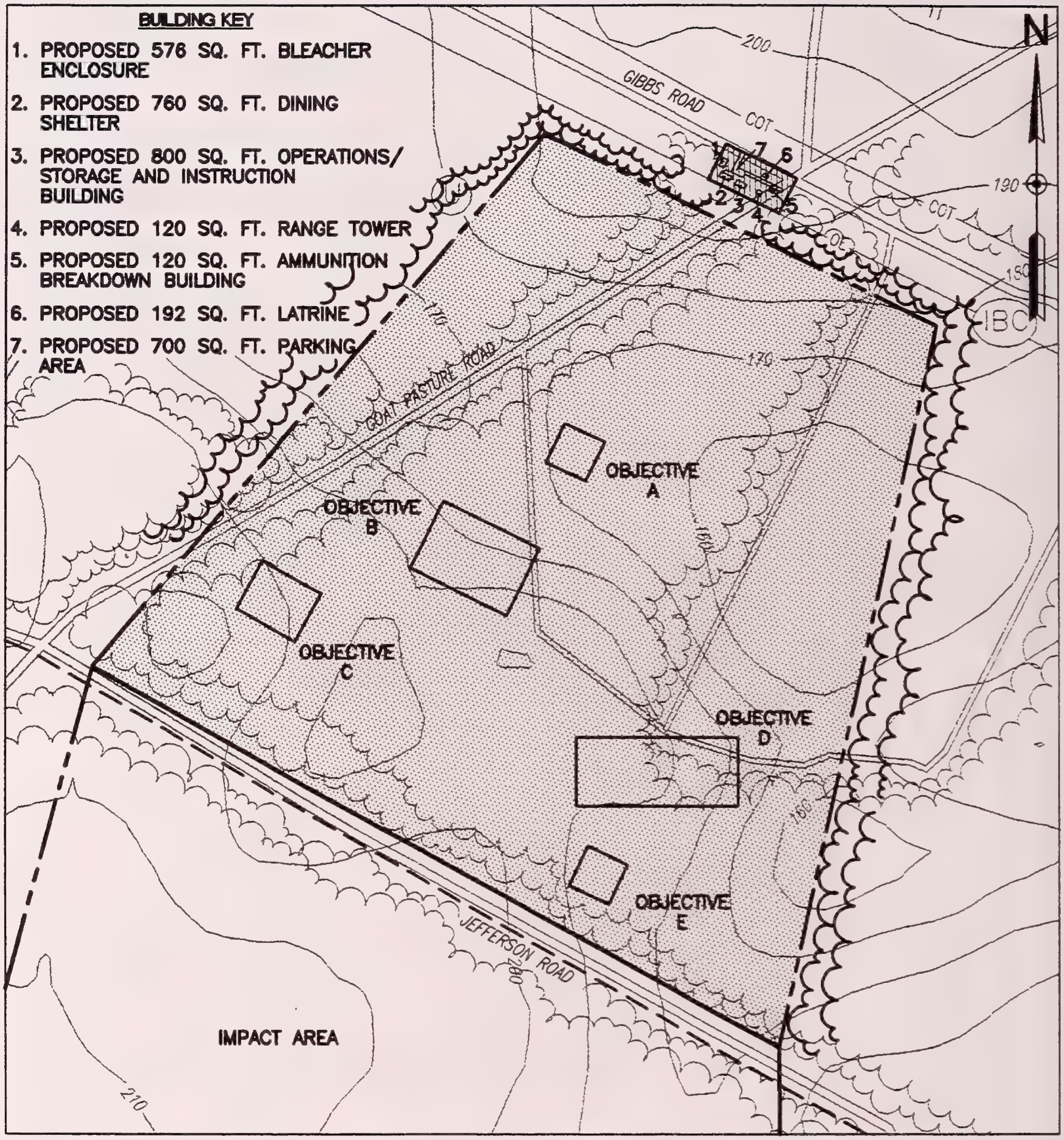
Figure 2-9



BUILDING KEY

1. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
2. PROPOSED 760 SQ. FT. DINING SHELTER
3. PROPOSED 800 SQ. FT. OPERATIONS/STORAGE AND INSTRUCTION BUILDING
4. PROPOSED 120 SQ. FT. RANGE TOWER
5. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
6. PROPOSED 192 SQ. FT. LATRINE
7. PROPOSED 700 SQ. FT. PARKING AREA

LEGEND

░	PROPOSED RANGE AREA
▨	PROPOSED SUPPORT AREA
— — —	PROPOSED SURFACE DANGER ZONE BOUNDARY
— — — —	IMPACT AREA BOUNDARY
⌒⌒⌒	PROPOSED WOODED AREA
⌒⌒	EXISTING WOODED AREA
Ⓐ	EXISTING RANGE
—— COT ——	EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION
—— OE ——	EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

PROPOSED RANGE AREA APPROXIMATELY 139 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

OBJECTIVES INCLUDE TARGET STATIONS SUCH AS ENEMY BUNKERS AND TRENCHES

0 300 600 FEET

1"=600'

Source: Camp Edwards Training Site

INFANTRY SQUAD BATTLE COURSE SCENARIO 1

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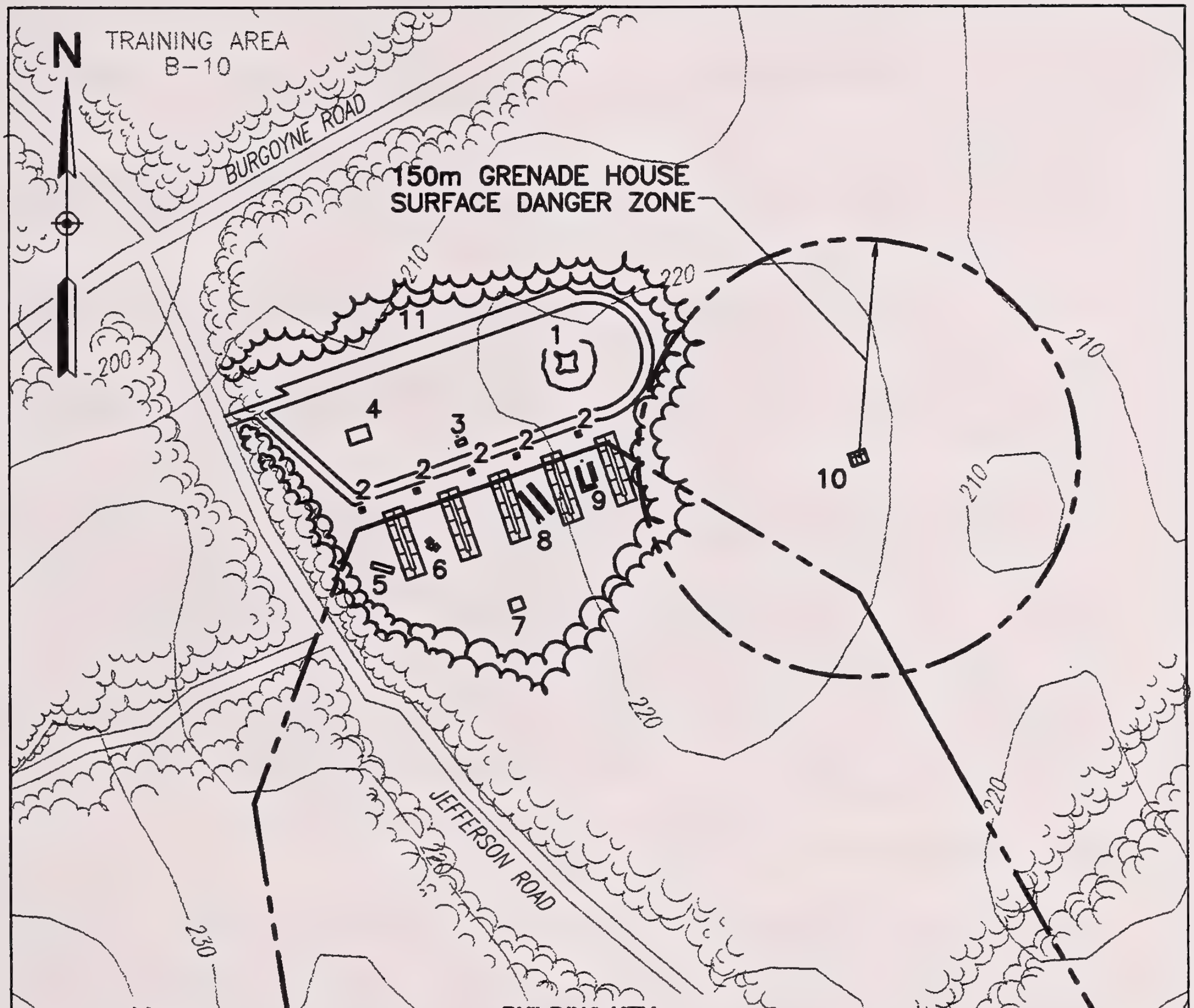
Figure 2-10



BUILDING KEY

1. PROPOSED 263 L.F. UNDERGROUND SEWER TRAINER
2. PROPOSED OBSERVATION TOWER
3. PROPOSED 336 SQ. FT. LATRINE
4. PROPOSED 4,608 SQ. FT. URBAN DEFENSE BUILDING
5. PROPOSED 576 SQ. FT. VAULT AND FIGHT FACILITY
6. PROPOSED 810 SQ. FT. CLEARING TECHNIQUES BUILDING
7. PROPOSED 120 SQ. FT. GRENADE GUNNERY
8. PROPOSED 960 SQ. FT. DESTINY DOORWAY
9. PROPOSED 1,792 SQ. FT. DODGE CITY
10. PROPOSED 1,938 SQ. FT. GRENADE HOUSE
11. PROPOSED 700 SQ. FT. PARKING LOT

LEGEND

— — — —	PROPOSED SURFACE DANGER ZONE BOUNDARY
⌒⌒⌒	PROPOSED WOODED AREA
⌒⌒⌒	EXISTING WOODED AREA

NOTE:
PROPOSED RANGE AREA
APPROXIMATELY 10 ACRES

0 200 400 FEET
1"=400'

Source: Camp Edwards Training Site

**MILITARY OPERATIONS
ON URBANIZED TERRAIN
MILITARY ASSAULT COURSE
SCENARIO 1**

File Name: J:\6650-14\6650F013.DWG

Figure 2-11

protected natural or cultural resources, or off-post residential housing. Additionally, this location is in proximity (approximately 500-yard foot march) to the proposed MOUT-CTF discussed below.

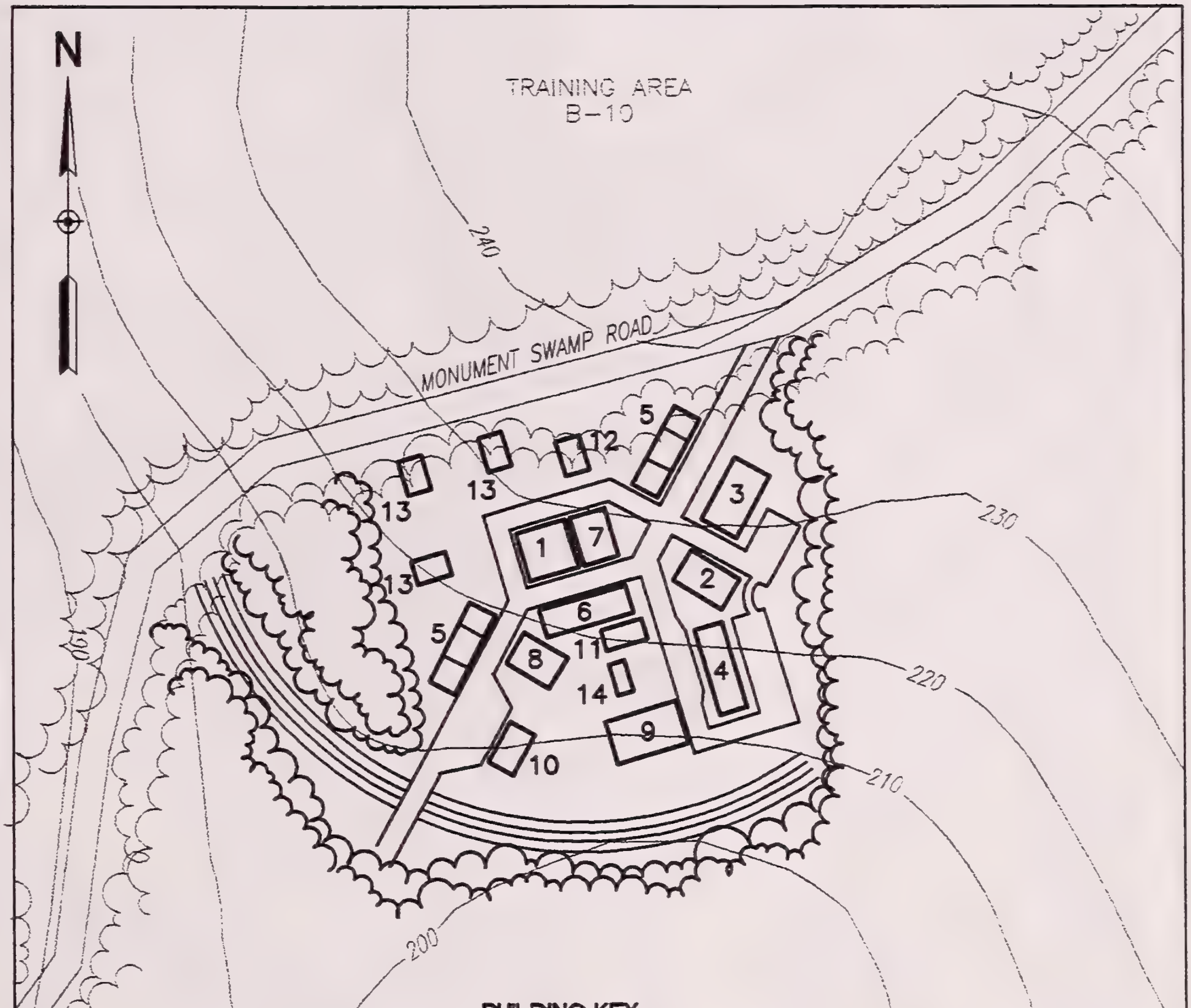
Military Operations on Urbanized Terrain-Collective Training Facility. This scenario would involve constructing MOUT-CTF in the B10 Training Area north of Burgoyne Road, west of Gibbs Road and south of Monument Swamp Road (Figure 2-12). This location is relatively flat and provides the necessary vegetation throughout the area to provide for concealed staging and maneuvering.

Clearing of vegetation for the project area (approximately 8 acres) would be required for construction; however, vegetation would be re-established to create the required tactical effects. This location is accessible via Burgoyne Road, and the surrounding area has adequate corridors for small or large troop movements. Electrical power is accessible and this location would not pose conflicts with the use of other ranges. This site is not near any known protected natural or cultural resources nor off-post residential housing. Additionally, under this scenario, MOUT-CTF would be approximately 500 yards from the proposed MOUT-MAC facility discussed above. This location is the same as MOUT-CTF Scenario 3.

2.6.1.2 Range Scenario 2

Modified Record Fire Range. The MRFR, under Range Scenario 2 (Figure 2-13), would involve converting M Range (abandoned J1 Range) on Greenway Road into the MRFR. This site provides the necessary natural vegetative setting and would require some clearing during construction. Additionally, M Range was a tank gunnery range in the past and would require removal of any unexploded munitions prior to any construction activities. This site is accessible via Greenway Road and provides existing electrical power access. Protected natural or cultural resources are not known to exist at this proposed location, but this alternative is close to off-site residential housing and could conflict with the existing use of L and N Ranges.

Multi-Purpose Machine Gun Transition Range. This alternative would involve converting I Range into the MPMR (Figure 2-14). This 25-m rifle range is cleared of vegetation; however, re-vegetation would be necessary in some areas to achieve the necessary tactical effects. Some project areas outside the limits of the existing range would be cleared during construction. This location is accessible via Pocasset Road but does not have electrical power access. This site may pose conflicts with Demo-1 Range. I Range is not near any known protected natural or cultural resources, but is near off-post residential housing. This location is the same as MRFR-Scenario 3 (see Section 2.6.1.3).



BUILDING KEY

1. HOTEL/CITY HALL
2. APARTMENT
3. SCHOOL
4. TOWNHOUSE
5. TOWNHOUSE RUBBLE
6. BUSINESS/RESIDENTIAL
7. OFFICE
8. OFFICE RUBBLE
9. WAREHOUSE
10. VEHICLE SERVICE STATION RUBBLE
11. RETAIL/BANK
12. RESIDENTIAL
13. RESIDENTIAL RUBBLE
14. LATRINE

LEGEND

⌒⌒⌒ (heavy)	PROPOSED WOODED AREA
⌒⌒⌒ (light)	EXISTING WOODED AREA
—— *210* ——	GROUND SURFACE CONTOUR

NOTES:

PROPOSED RANGE AREA APPROXIMATELY 8 ACRES

MOUT-CTF IS PROPOSED IN THE SAME LOCATION FOR BOTH SCENARIO 1 AND SCENARIO 3

0 100 200 FEET

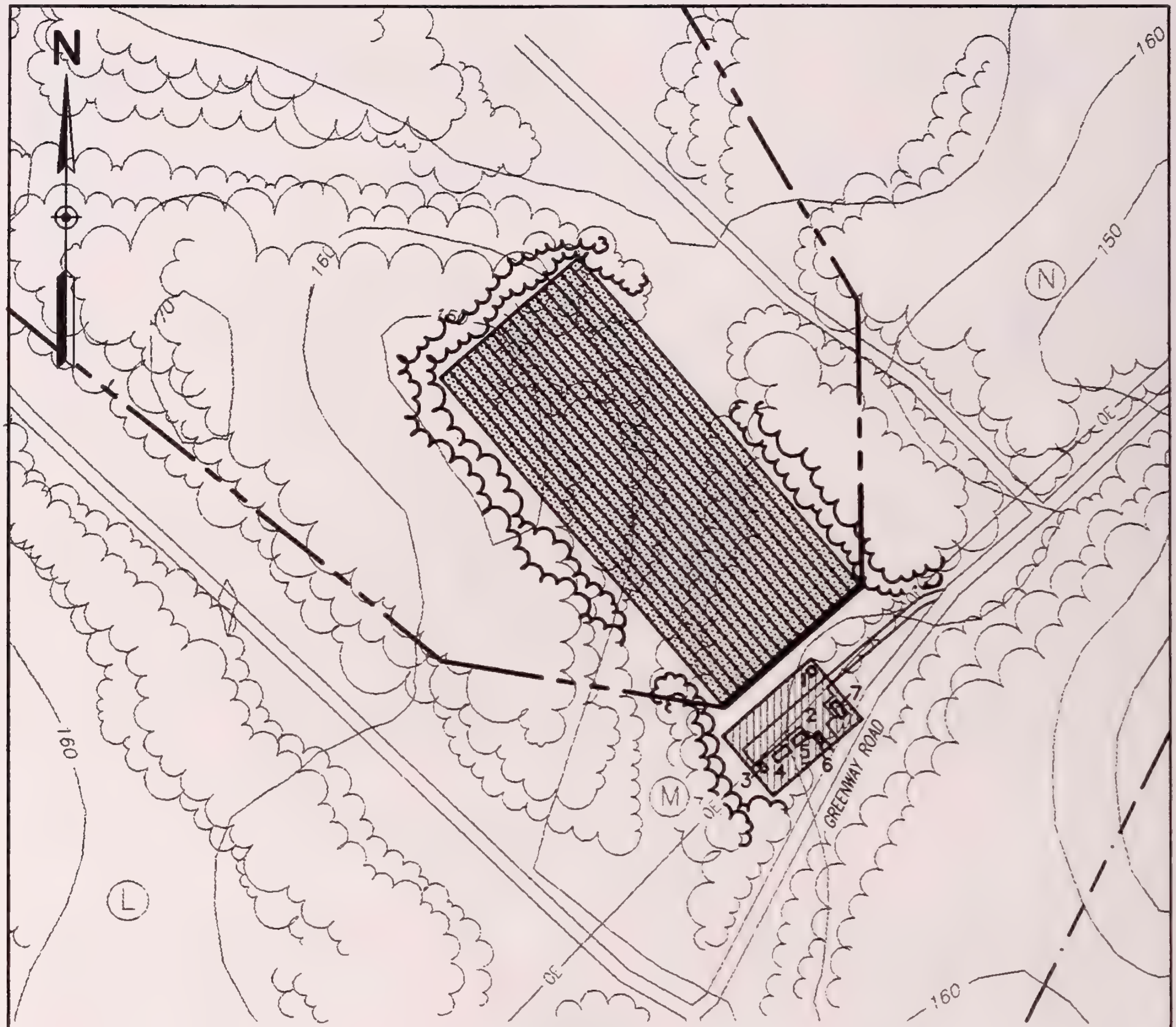
1"=200'

Source: Camp Edwards Training Site

MILITARY OPERATIONS ON URBANIZED TERRAIN COLLECTIVE TRAINING FACILITY SCENARIOS 1 AND 3

File Name: J:\6650-14\6650F010.DWG

Figure 2-12



BUILDING KEY

1. PROPOSED 120 SQ. FT. RANGE TOWER
2. PROPOSED 700 SQ. FT. PARKING AREA
3. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
4. PROPOSED 800 SQ. FT. OPERATIONS/STORAGE AND INSTRUCTION BUILDING
5. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
6. PROPOSED 192 SQ. FT. LATRINE
7. PROPOSED 760 SQ. FT. DINING SHELTER

LEGEND

▒	PROPOSED RANGE AREA
▨	PROPOSED SUPPORT AREA
— - - —	PROPOSED SURFACE DANGER ZONE BOUNDARY
——	PROPOSED FIRING LANES
Ⓐ	EXISTING RANGE
— · — —	INSTALLATION BOUNDARY
⌒⌒⌒	PROPOSED WOODED AREA
⌒⌒⌒	EXISTING WOODED AREA
—— OE ——	EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

PROPOSED RANGE AREA APPROXIMATELY 9.5 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

0 200 400 FEET

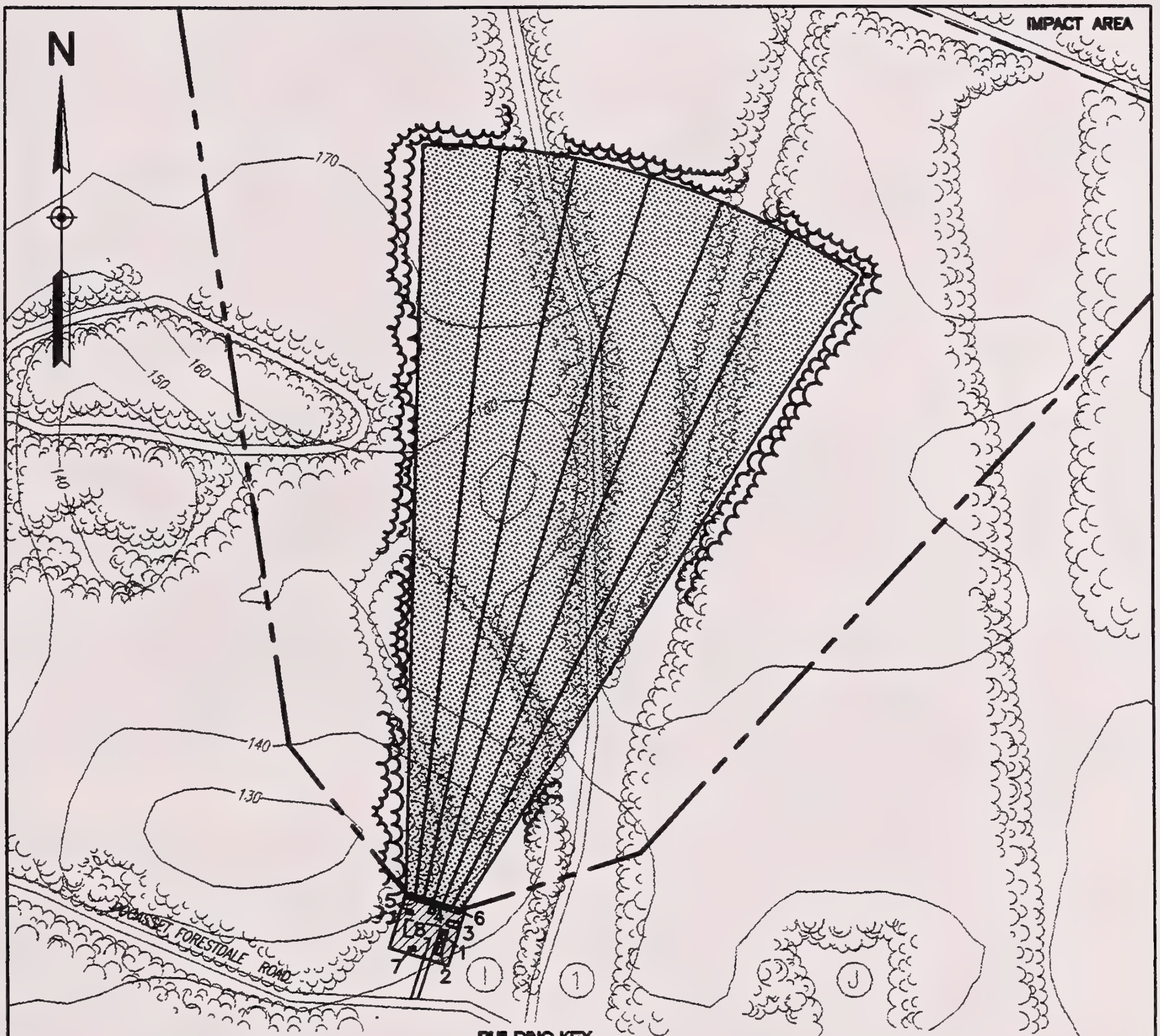
1"=400'

Source: Camp Edwards Training Site

MODIFIED RECORD FIRE RANGE
SCENARIO 2

File Name: J:\6650-14\6650FA20.DWG

Figure 2-13



BUILDING KEY

1. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
2. PROPOSED 760 SQ. FT. DINING SHELTER
3. PROPOSED 800 SQ. FT. OPERATIONS/STORAGE AND INSTRUCTION BUILDING
4. PROPOSED 120 SQ. FT. RANGE TOWER
5. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
6. PROPOSED 6 POSITION FIRING LINE
7. PROPOSED 192 SQ. FT. LATRINE
8. PROPOSED 700 SQ. FT. PARKING AREA

LEGEND

▒ PROPOSED RANGE AREA
▨ PROPOSED SUPPORT AREA
— - — PROPOSED SURFACE DANGER ZONE BOUNDARY
—— PROPOSED FIRING LANES
— — — IMPACT AREA BOUNDARY
⌒⌒ PROPOSED WOODED AREA
⌒⌒ EXISTING WOODED AREA
Ⓐ EXISTING RANGE
① EXISTING MORTAR POSTION

NOTE:

PROPOSED RANGE AREA APPROXIMATELY 54 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

0 300 600 FEET
1"=600'

Source: Camp Edwards Training Site

MULTI-PURPOSE MACHINE GUN TRANSITION RANGE SCENARIO 2

File Name: J:\6650-14\6650FA18.DWG

Figure 2-14

Infantry Squad Battle Course. This alternative would involve constructing the ISBC south of J3 Range on the southeastern side of the training area (Figure 2-15). This location meets vegetative requirements; however, some clearing during construction would be necessary. Existing road access (Greenway Road) is adequate and power access is available. This alternative could pose conflicts with KD Range and is close to off-post residential housing; however, this site is not near any known protected natural or cultural resources.

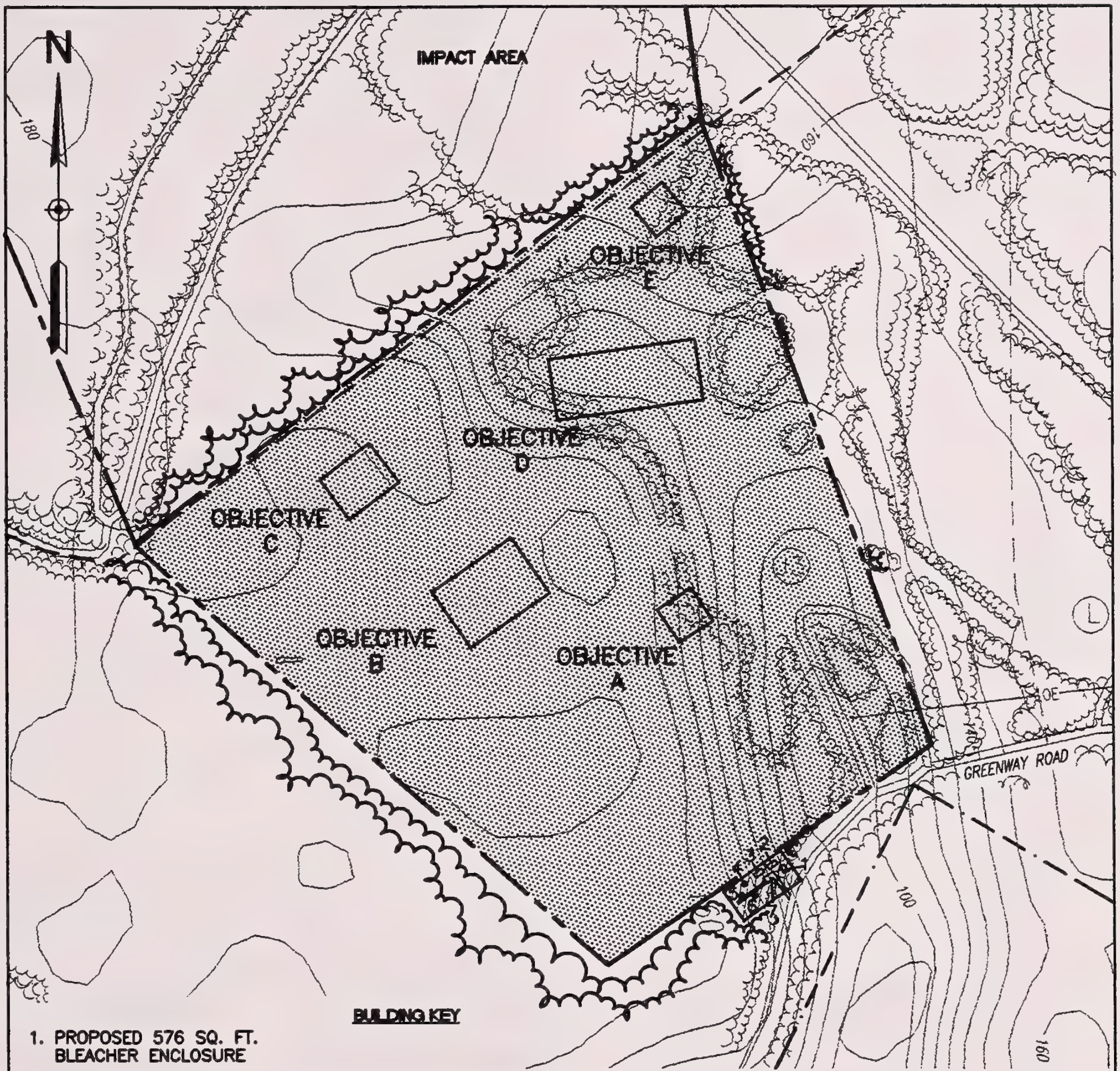
Military Operations on Urbanized Terrain-Military Assault Course. This scenario would involve constructing the MOUT-MAC south of E Range, east of Burgoyne Road and north of Monument Beach Road (Figure 2-16). This location provides the necessary vegetation, but the project area (10 acres) would require clearing for construction. Some vegetation would be re-established to create the necessary tactical effects.

Site access would be provided via Burgoyne Road. Electrical power access is available and this location does not pose conflicts with the use of other ranges. This site is not near any known protected natural or cultural resources or off-post residential housing. Additionally, this location is in proximity (approximately 500-yard foot march) to the proposed MOUT-CTF discussed below.

Military Operations on Urbanized Terrain-Collective Training Facility. This scenario would involve constructing MOUT-CTF in the B7 Training Area west of Burgoyne Road and south of Monument Beach Road (Figure 2-17). This location is relatively flat and provides the adequate vegetation throughout the area to provide for concealed staging and maneuvering, although clearing of the project area (approximately 8 acres) for construction would be required. This location provides access via Burgoyne Road and corridors for small or large troop movements. Electrical power is accessible, and this location would not pose conflicts with the use of other ranges. It is not near known protected natural or cultural resources or off-post residential housing. Additionally, under this scenario, MOUT-CTF would be approximately 500 yards from the proposed MOUT-MAC facility discussed above.

2.6.1.3 Range Scenario 3

Modified Record Fire Range. The MRFR, under Range Scenario 3 (Figure 2-18), would involve converting the I Range on Pocasset Road into the MRFR. Some project areas outside the limits of the existing range would be cleared during construction. This site provides access via Pocasset Road; however, existing electrical power access does not exist. If converted into the MRFR, this location could conflict with the use of Demo-1 and KD Ranges, and Mortar Position 1. I Range is not proximal to known protected natural or cultural resources, but is near off-post residential housing. This alternative is the same location as MPMR-Scenario 2 (see Section 2.6.1.2).



BUILDING KEY

1. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
2. PROPOSED 760 SQ. FT. DINING SHELTER
3. PROPOSED 800 SQ. FT. OPERATIONS/STORAGE AND INSTRUCTION BUILDING
4. PROPOSED 120 SQ. FT. RANGE TOWER
5. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
6. PROPOSED 192 SQ. FT. LATRINE
7. PROPOSED 700 SQ. FT. PARKING AREA

LEGEND

░ PROPOSED RANGE AREA
▨ PROPOSED SUPPORT AREA
— — — PROPOSED SURFACE DANGER ZONE BOUNDARY
— · — INSTALLATION BOUNDARY
– – – – IMPACT AREA BOUNDARY
⁀⁀⁀ PROPOSED WOODED AREA
⁀⁀⁀ EXISTING WOODED AREA
Ⓐ EXISTING RANGE
—— OE —— EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

PROPOSED RANGE AREA APPROXIMATELY 139 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

OBJECTIVES INCLUDE TARGET STATIONS SUCH AS ENEMY BUNKERS AND TRENCHES

0 350 700 FEET
1"=700'

Source: Camp Edwards Training Site

INFANTRY SQUAD BATTLE COURSE SCENARIO 2

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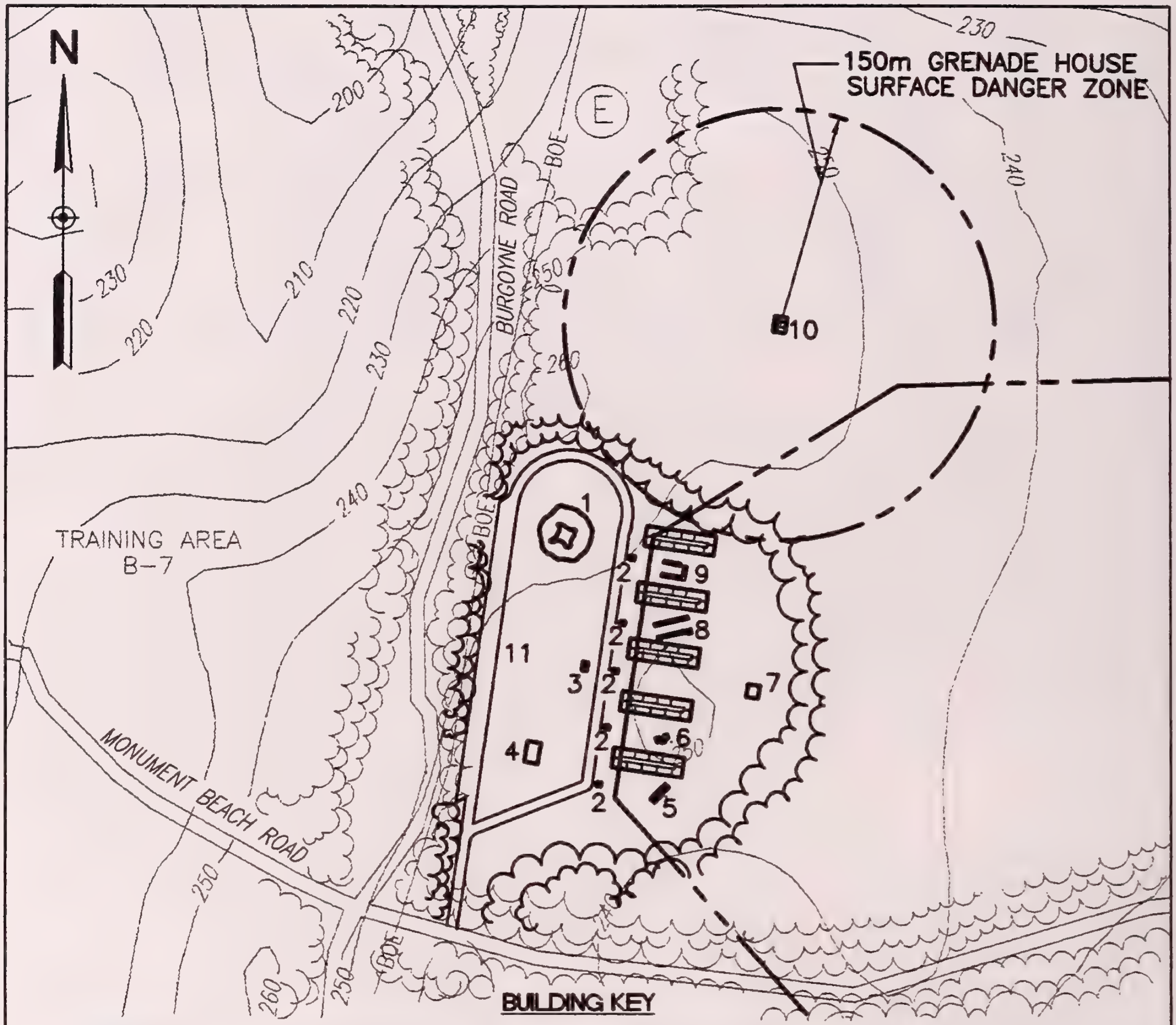
Figure 2-15



BUILDING KEY

1. PROPOSED 263 L.F. UNDERGROUND SEWER TRAINER
2. PROPOSED OBSERVATION TOWER
3. PROPOSED 336 SQ. FT. LATRINE
4. PROPOSED 4,608 SQ. FT. URBAN DEFENSE BUILDING
5. PROPOSED 576 SQ. FT. VAULT AND FIGHT FACILITY
6. PROPOSED 810 SQ. FT. CLEARING TECHNIQUES BUILDING
7. PROPOSED 120 SQ. FT. GRENADE GUNNERY
8. PROPOSED 960 SQ. FT. DESTINY DOORWAY
9. PROPOSED 1,792 SQ. FT. DODGE CITY
10. PROPOSED 1,938 SQ. FT. GRENADE HOUSE
11. PROPOSED 700 SQ. FT. PARKING LOT

LEGEND

— — — PROPOSED SURFACE DANGER ZONE BOUNDARY

PROPOSED WOODED AREA

EXISTING WOODED AREA

(A) EXISTING RANGE

—BOE— EXISTING BASE OVERHEAD ELECTRIC DISTRIBUTION

NOTE:
PROPOSED RANGE AREA APPROXIMATELY 10 ACRES

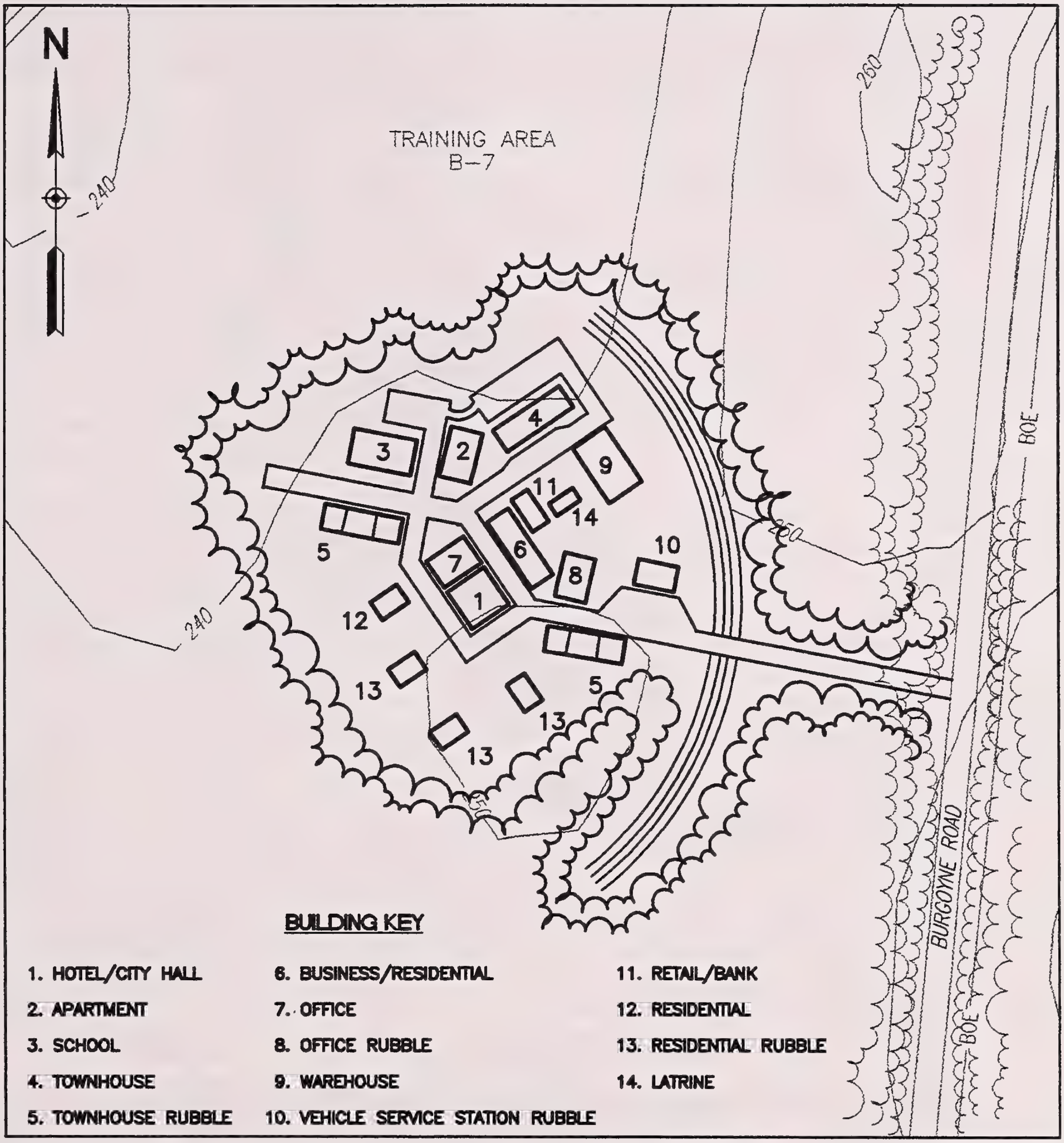
0 200 400 FEET
1"=400'

Source: Camp Edwards Training Site

MILITARY OPERATIONS ON URBANIZED TERRAIN MILITARY ASSAULT COURSE SCENARIO 2

File Name: J:\6650-14\6650F020.DWG

Figure 2-16



BUILDING KEY

1. HOTEL/CITY HALL
2. APARTMENT
3. SCHOOL
4. TOWNHOUSE
5. TOWNHOUSE RUBBLE
6. BUSINESS/RESIDENTIAL
7. OFFICE
8. OFFICE RUBBLE
9. WAREHOUSE
10. VEHICLE SERVICE STATION RUBBLE
11. RETAIL/BANK
12. RESIDENTIAL
13. RESIDENTIAL RUBBLE
14. LATRINE

LEGEND

PROPOSED WOODED AREA

EXISTING WOODED AREA

——BOE—— EXISTING BASE OVERHEAD ELECTRIC DISTRIBUTION

NOTE:
PROPOSED RANGE AREA
APPROXIMATELY 8 ACRES

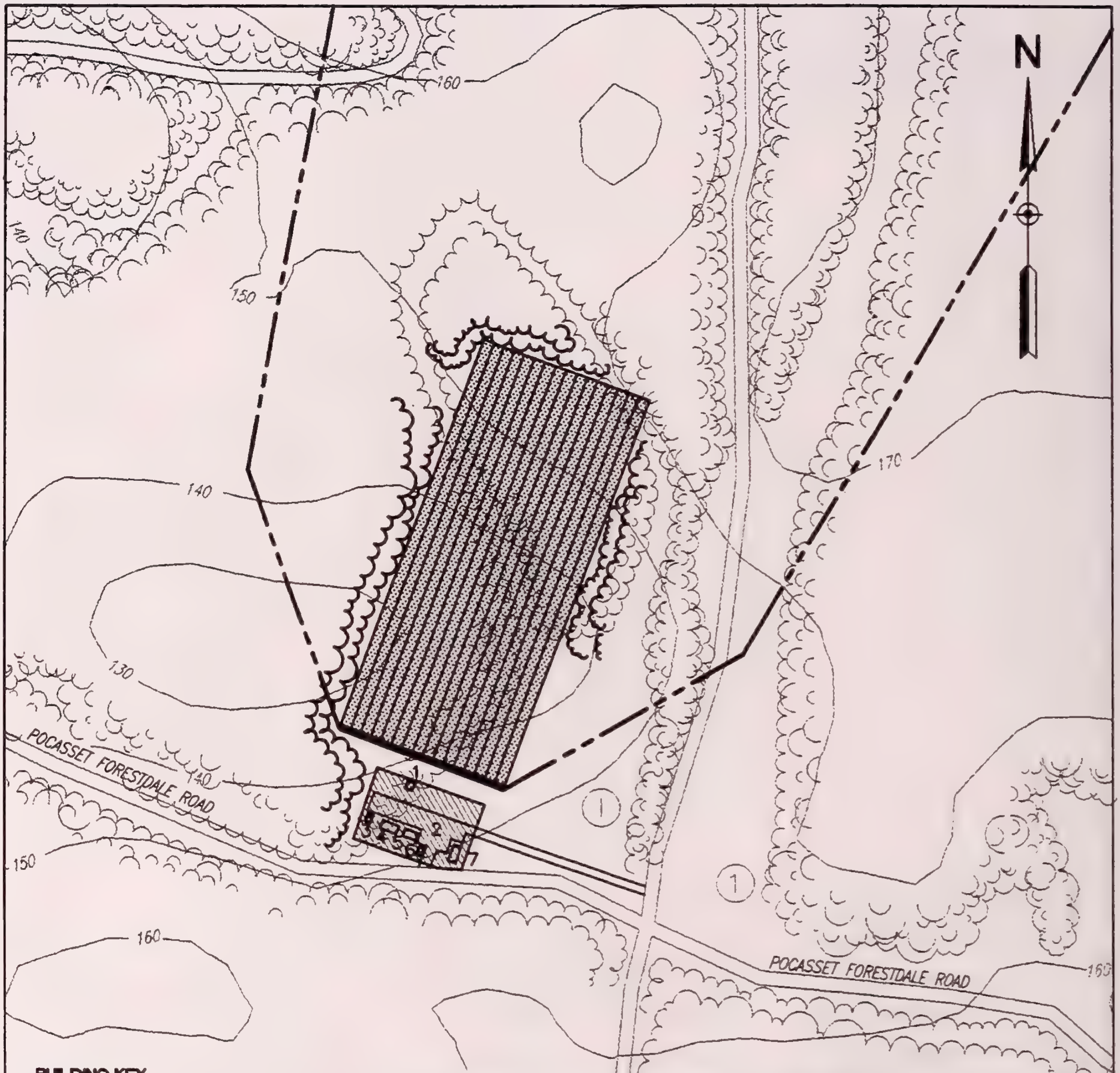
0 100 200 FEET
1"=200'

Source: Camp Edwards Training Site

MILITARY OPERATIONS ON URBANIZED TERRAIN COLLECTIVE TRAINING FACILITY SCENARIO 2

File Name: J:\6650-14\6650F011.DWG

Figure 2-17



BUILDING KEY

1. PROPOSED 120 SQ. FT. RANGE TOWER
2. PROPOSED 700 SQ. FT. PARKING AREA
3. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
4. PROPOSED 800 SQ. FT. OPERATIONS/ STORAGE AND INSTRUCTION BUILDING
5. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
6. PROPOSED 192 SQ. FT. LATRINE
7. PROPOSED 760 SQ. FT. DINING SHELTER

LEGEND

▒	PROPOSED RANGE AREA
▨	PROPOSED SUPPORT AREA
— - —	PROPOSED SURFACE DANGER ZONE BOUNDARY
—	PROPOSED FIRING LANES
⌒⌒	PROPOSED WOODED AREA
⌒	EXISTING WOODED AREA
Ⓐ	EXISTING RANGE
①	EXISTING MORTAR POSITION

NOTES:

PROPOSED RANGE AREA APPROXIMATELY 9.5 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

0 200 400 FEET

1"=400'

Source: Camp Edwards Training Site

MODIFIED RECORD FIRE RANGE SCENARIO 3

File Name: J:\6650-14\6650FA23.DWG

Figure 2-18

Multi-Purpose Machine Gun Transition Range. This alternative would involve constructing the MPMR south of the intersection of Burgoyne and Gibbs Roads known as Wagner's Corner (Figure 2-19). This location provides the necessary vegetation; however, this site is currently undeveloped and would require some clearing or topping of vegetation during construction (vegetation would be re-established in some area to create necessary tactical effects). This location is accessible via Burgoyne and Gibbs Roads; however, site access roads into the complex and downrange maintenance roads would need to be developed. Utility access is available; however, electrical tie-ins would be necessary. This location is not near off-post residential housing nor any known protected natural or cultural resources, but may pose conflicts with the existing IBC Range (or converted ISBC, see Section 2.6.1.1).

Infantry Squad Battle Course. This scenario would involve converting M Range (abandoned) on Greenway Road into the ISBC (Figure 2-20). This site provides the necessary natural vegetative setting and would not require much clearing. Additionally, M Range was a tank gunnery range in the past and would require any unexploded ordnance be removed prior to construction. This site provides access via Greenway Road and existing electrical power, but could pose conflicts with the use of N Range. This site is not near any known protected natural or cultural resources, but is close to residential housing. This alternative location is the same as MRFR-Scenario 2 (see Section 2.6.1.2).

Military Operations on Urbanized Terrain-Military Assault Course. This scenario would involve constructing the MOUT-MAC approximately 400 yards NE of the intersection of Burgoyne Road and Orchard Road (Figure 2-21). This location provides the necessary vegetation, but clearing of the project area (8 acres) would be required for construction. Vegetation would be re-established to create necessary tactical effects. Site access would be via Burgoyne Road, and electrical power access is available. This location would not pose conflicts with the use of other ranges and is not near any known protected natural or cultural resources or off-post residential housing. MOUT-MAC would be approximately 1,300 yards from the proposed MOUT-CTF discussed below.

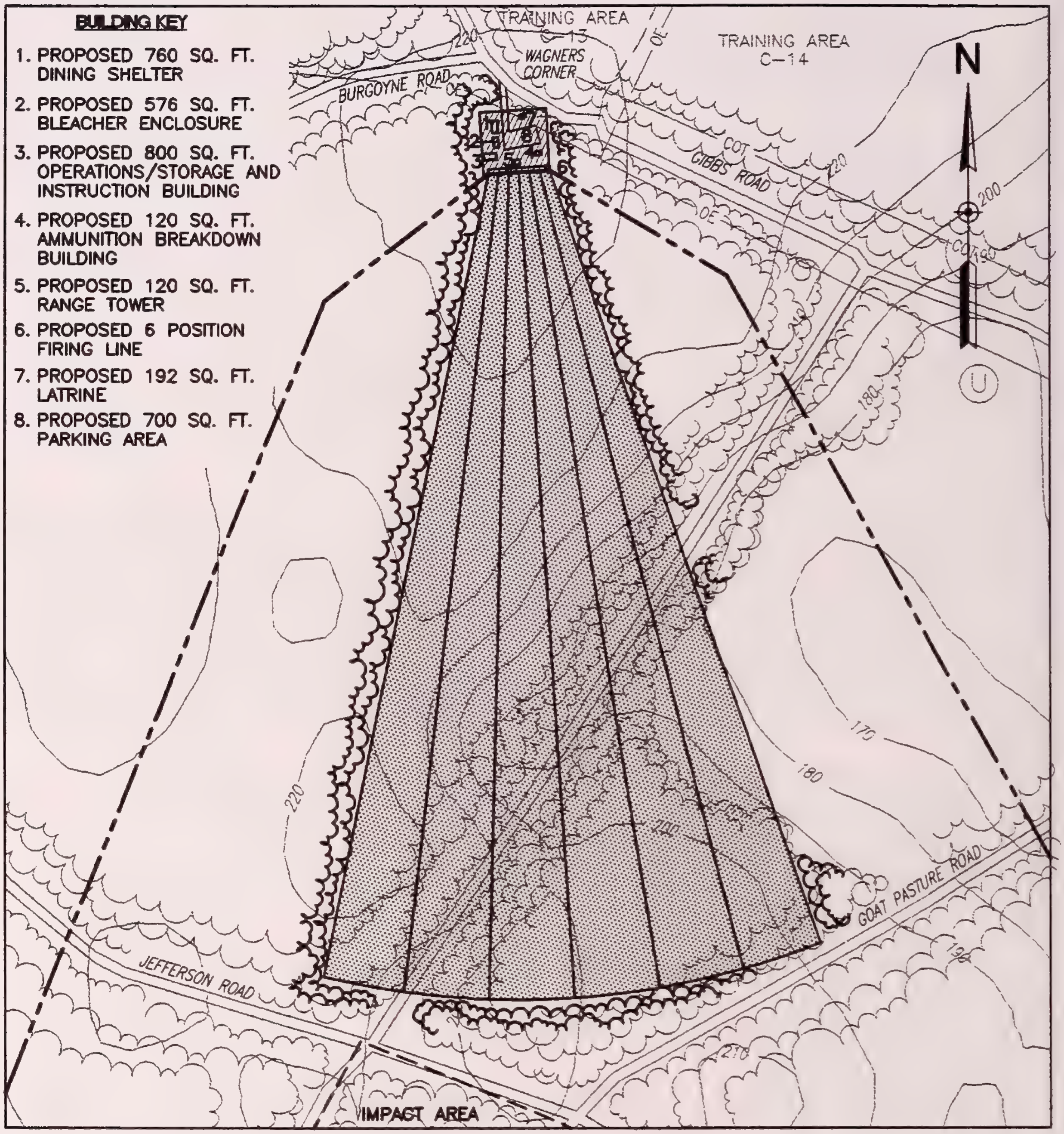
Military Operations on Urbanized Terrain-Collective Training Facility. This scenario would involve constructing MOUT-CTF in the same location as discussed in Scenario 1 (see Section 2.6.1.1 and Figure 2-12). Under this scenario, MOUT-CTF would be approximately 1,300 yards from the proposed MOUT-MAC facility discussed above.

2.6.1.4 Range Scenario 4 (No Action Alternative)

Modified Record Fire Range. The No Action Alternative would involve no new construction and the continued use of existing outdated alternate training facilities at MMR. Training and alternate qualification on Ranges B, C, H, I, and KD at MMR would continue.

BUILDING KEY

1. PROPOSED 760 SQ. FT. DINING SHELTER
2. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
3. PROPOSED 800 SQ. FT. OPERATIONS/STORAGE AND INSTRUCTION BUILDING
4. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
5. PROPOSED 120 SQ. FT. RANGE TOWER
6. PROPOSED 6 POSITION FIRING LINE
7. PROPOSED 192 SQ. FT. LATRINE
8. PROPOSED 700 SQ. FT. PARKING AREA



LEGEND

▒	PROPOSED RANGE AREA
▨	PROPOSED SUPPORT AREA
— - - —	PROPOSED SURFACE DANGER ZONE BOUNDARY
——	PROPOSED FIRING LANES
— — — —	IMPACT AREA BOUNDARY
⌒⌒⌒	PROPOSED WOODED AREA
⌒⌒⌒	EXISTING WOODED AREA
(A)	EXISTING RANGE
—COT—	EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION
—OE—	EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTE:

PROPOSED RANGE AREA APPROXIMATELY 54 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

0 250 500 FEET

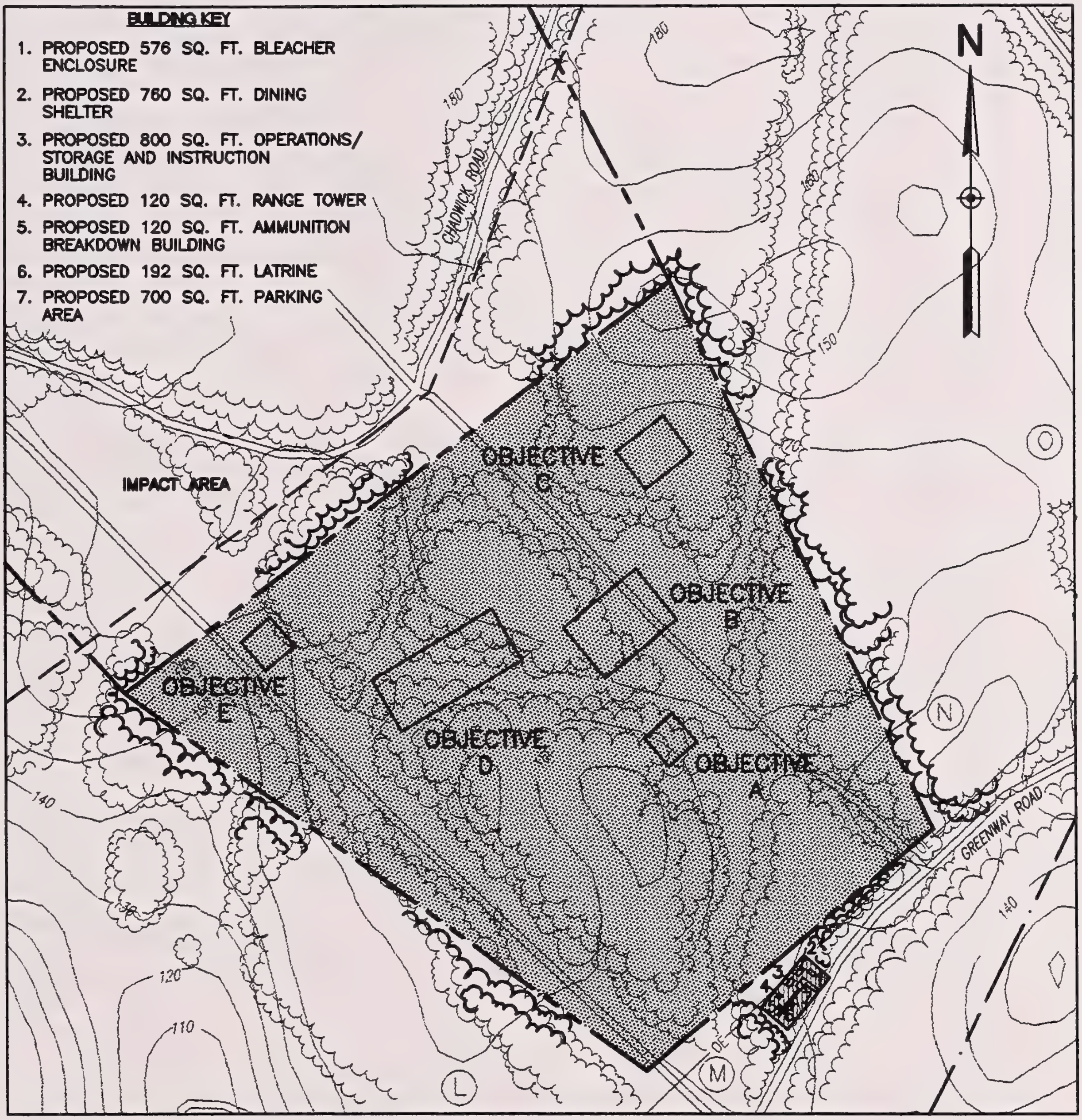
1"=500'

Source: Camp Edwards Training Site

MULTI-PURPOSE MACHINE GUN TRANSITION RANGE SCENARIO 3

File Name: J:\6650-14\6650FA24.DWG

Figure 2-19



BUILDING KEY

1. PROPOSED 576 SQ. FT. BLEACHER ENCLOSURE
2. PROPOSED 760 SQ. FT. DINING SHELTER
3. PROPOSED 800 SQ. FT. OPERATIONS/ STORAGE AND INSTRUCTION BUILDING
4. PROPOSED 120 SQ. FT. RANGE TOWER
5. PROPOSED 120 SQ. FT. AMMUNITION BREAKDOWN BUILDING
6. PROPOSED 192 SQ. FT. LATRINE
7. PROPOSED 700 SQ. FT. PARKING AREA

LEGEND

▨ PROPOSED RANGE AREA

▨ PROPOSED SUPPORT AREA

PROPOSED SURFACE DANGER ZONE BOUNDARY

INSTALLATION BOUNDARY

IMPACT AREA BOUNDARY

PROPOSED WOODED AREA

EXISTING WOODED AREA

Ⓐ EXISTING RANGE

—OE— EXISTING COMM. ELECTRIC CO. OVERHEAD DISTRIBUTION

NOTES:

PROPOSED RANGE AREA APPROXIMATELY 139 ACRES

PROPOSED SUPPORT AREA APPROXIMATELY 1 ACRE

OBJECTIVES INCLUDE TARGET STATIONS SUCH AS ENEMY BUNKERS AND TRENCHES

0 350 700 FEET

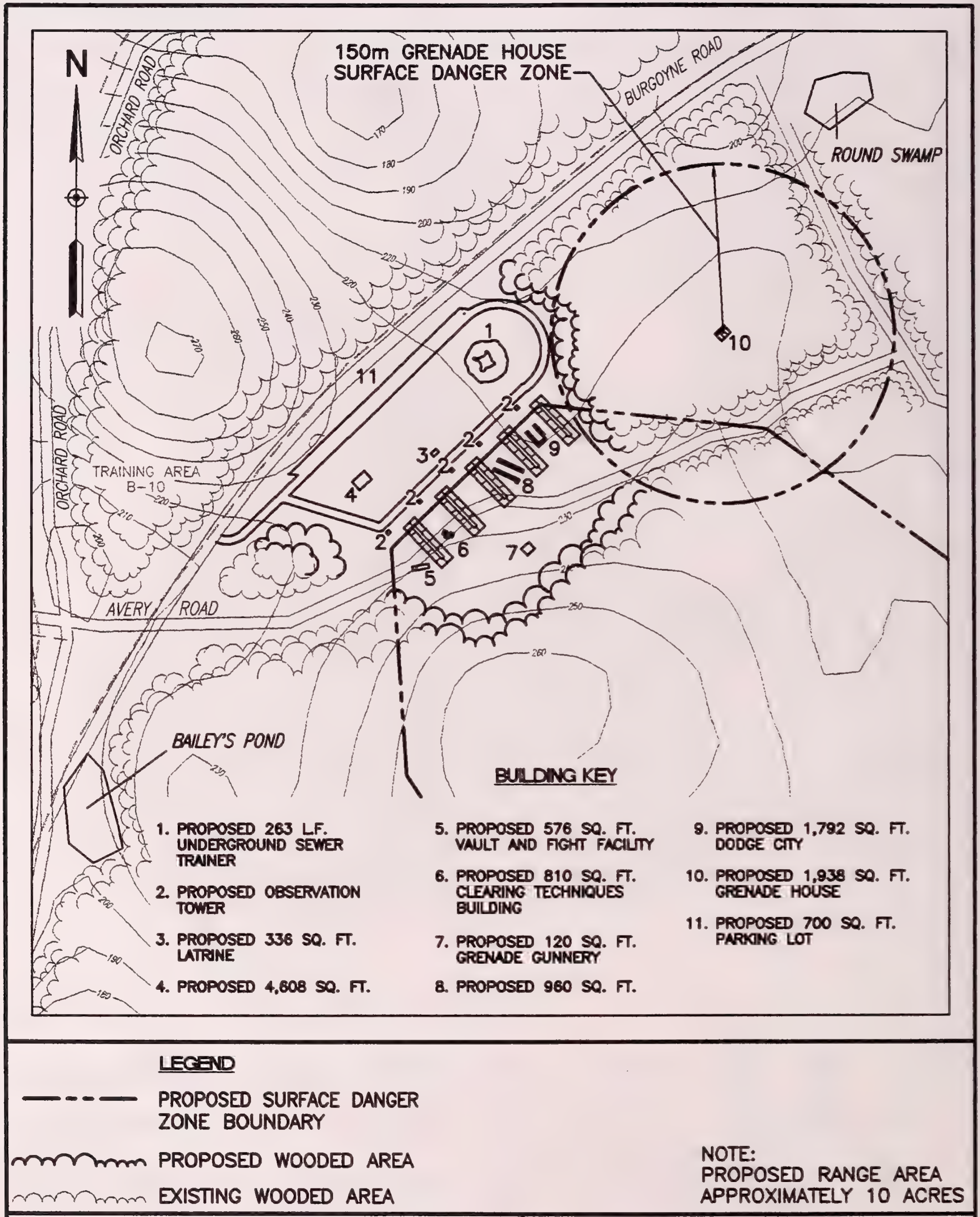
1"=700'

Source: Camp Edwards Training Site

INFANTRY SQUAD BATTLE COURSE SCENARIO 3

File Name: J:\6650-14\6650FA22.DWG

Figure 2-20



BUILDING KEY

1. PROPOSED 263 L.F. UNDERGROUND SEWER TRAINER
2. PROPOSED OBSERVATION TOWER
3. PROPOSED 336 SQ. FT. LATRINE
4. PROPOSED 4,608 SQ. FT.
5. PROPOSED 576 SQ. FT. VAULT AND FIGHT FACILITY
6. PROPOSED 810 SQ. FT. CLEARING TECHNIQUES BUILDING
7. PROPOSED 120 SQ. FT. GRENADE GUNNERY
8. PROPOSED 960 SQ. FT.
9. PROPOSED 1,792 SQ. FT. DODGE CITY
10. PROPOSED 1,938 SQ. FT. GRENADE HOUSE
11. PROPOSED 700 SQ. FT. PARKING LOT

LEGEND

PROPOSED SURFACE DANGER ZONE BOUNDARY

PROPOSED WOODED AREA

EXISTING WOODED AREA

NOTE:
PROPOSED RANGE AREA
APPROXIMATELY 10 ACRES

0 200 400 FEET
1"=400'

Source: Camp Edwards Training Site

MILITARY OPERATIONS
ON URBANIZED TERRAIN
MILITARY ASSAULT COURSE
SCENARIO 3

File Name: J:\6650-14\6650F023.DWG

Figure 2-21

Multi-Purpose Machine Gun Transition Range. The No Action Alternative would involve no new construction and the continued use of existing training facilities at MMR. Soldiers would be required to continue training and qualification on alternative ranges (G, H, KD, SE/SW) at MMR or travel to Fort Drum, New York, in order to conduct AT requirements at an actual MPMR.

Infantry Squad Battle Course. The No Action Alternative would involve no new construction such that training on the existing modified or alternate IBC at MMR would continue.

Military Operations on Urbanized Terrain-Military Assault Course. The No Action Alternative would involve no new construction and the continued use of Fort Pickett, Virginia (for AT only due to travel logistics), or possibly Fort Drum, New York, facilities to conduct all required MOUT-MAC training.

Military Operations on Urbanized Terrain-Collective Training Facility. The No Action Alternative would involve no new construction and the continued use of Fort Pickett, Virginia, and possibly Fort Drum, New York, facilities to conduct all required MOUT-CTF training.

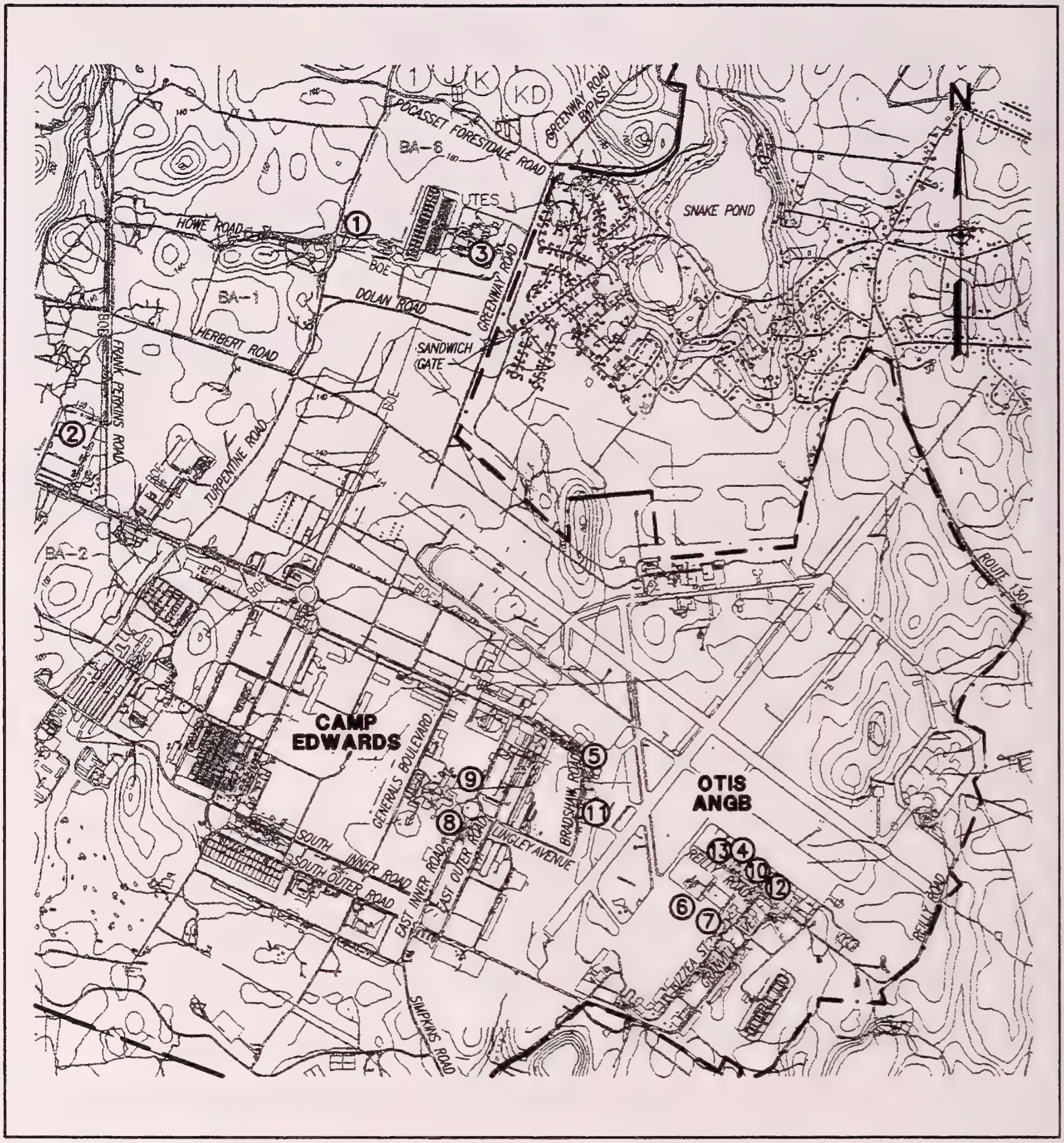
2.6.2 Cantonment Project Alternatives

As discussed in Section 2.4, the Cantonment Project Alternatives are independent from each other from both an operational and locality standpoint and, therefore, are presented as individual project alternatives. The alternatives outlined below represent the range of alternatives for the Cantonment Projects to be analyzed in this document. Table 2-2 (see Section 2.3) provides a summary of these Cantonment Projects. Figure 2-22 provides an overview of the Cantonment Project alternatives.

2.6.2.1 Unit Training Equipment Site

Figures 2-23 through 2-25 represent the UTES project alternatives for MAARNG.

Alternative 1. This alternative would include constructing the UTES west of the BOMARC Complex and east of the intersection of Howe and Turpentine Roads (Figure 2-23). This location is near the training area, is adjacent to the existing vehicle wash-rack and fuel dispensing site, and is close to existing paved and unpaved training site roadways.



LEGEND

① UTES PROJECT ALTERNATIVE #1

② UTES PROJECT ALTERNATIVE #2

③ UTES PROJECT ALTERNATIVE #3

④ AIRFIELD CONTROL TOWER PROJECT ALTERNATIVE #1

⑤ AIRFIELD CONTROL TOWER PROJECT ALTERNATIVE #2

⑥ AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVE #1

⑦ AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVE #2

⑧ ENVIRONMENTAL FACILITY PROJECT ALTERNATIVE #1

⑨ ENVIRONMENTAL FACILITY PROJECT ALTERNATIVE #2

⑩ FIRE STATION PROJECT ALTERNATIVE #1

⑪ FIRE STATION PROJECT ALTERNATIVE #2

⑫ FIRE STATION PROJECT ALTERNATIVE #3

⑬ FIRE STATION PROJECT ALTERNATIVE #4

— · — — INSTALLATION BOUNDARY

——COT—— EXISTING COMM. ELECTRIC CO. OVERHEAD TRANSMISSION

——BOE—— EXISTING BASE OVERHEAD ELECTRIC DISTRIBUTION

0 1400 2800 FEET

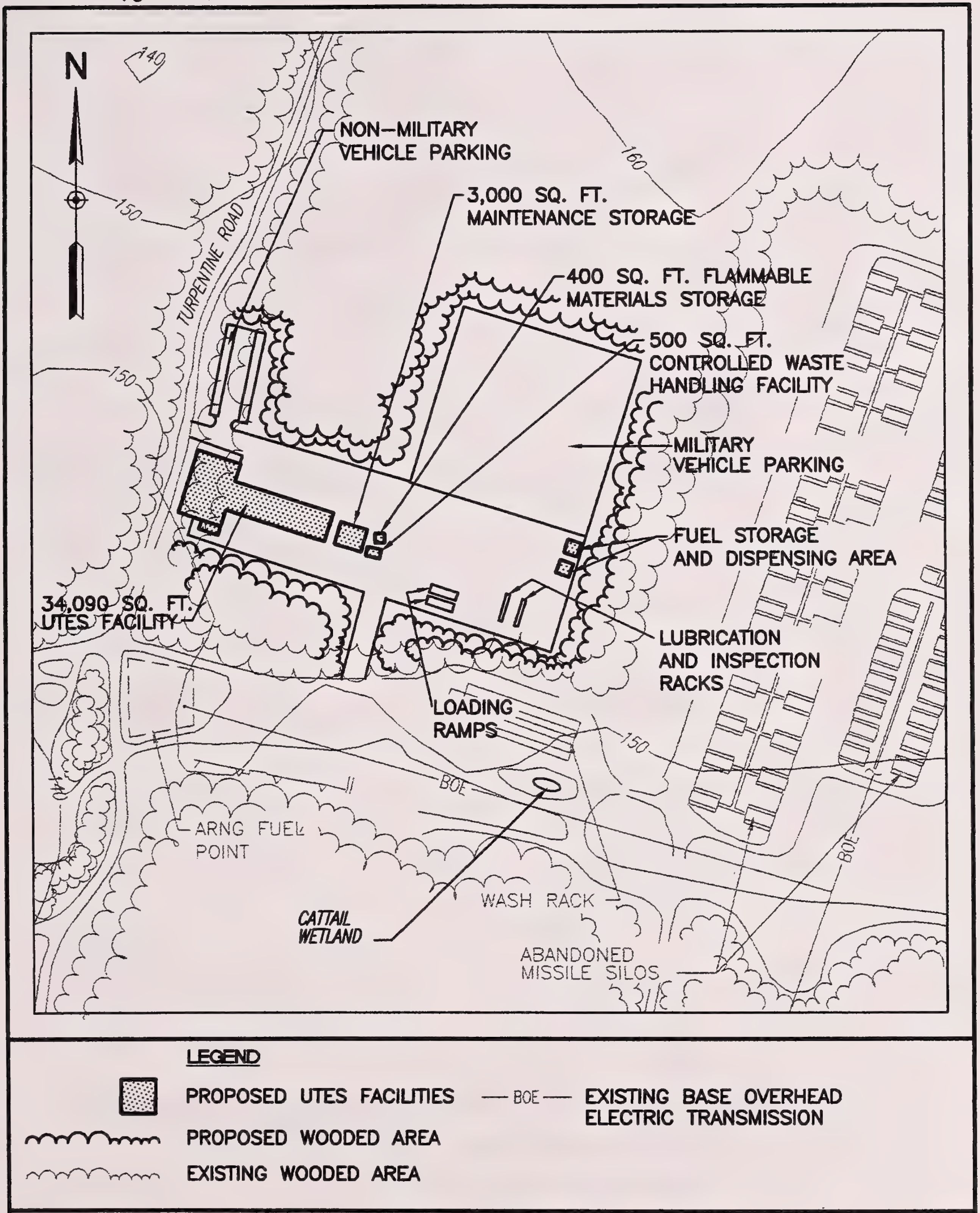
1"=2800'

Source: Camp Edwards Training Site
Otis ANGB

CANTONMENT PROJECT ALTERNATIVES

File Name: J:\6650-14\6650F028.DWG

Figure 2-22


N
140
160
150
150
NON-MILITARY VEHICLE PARKING
3,000 SQ. FT. MAINTENANCE STORAGE
TURPENTINE ROAD
400 SQ. FT. FLAMMABLE MATERIALS STORAGE
500 SQ. FT. CONTROLLED WASTE HANDLING FACILITY
MILITARY VEHICLE PARKING
FUEL STORAGE AND DISPENSING AREA
34,090 SQ. FT. UTES FACILITY
LUBRICATION AND INSPECTION RACKS
LOADING RAMPS
150
BOE
140
ARNG FUEL POINT
BOE
WASH RACK
CATTAIL WETLAND
ABANDONED MISSILE SILOS
LEGEND
PROPOSED UTES FACILITIES
PROPOSED WOODED AREA
EXISTING WOODED AREA
— BOE — EXISTING BASE OVERHEAD ELECTRIC TRANSMISSION

0 150 300 FEET

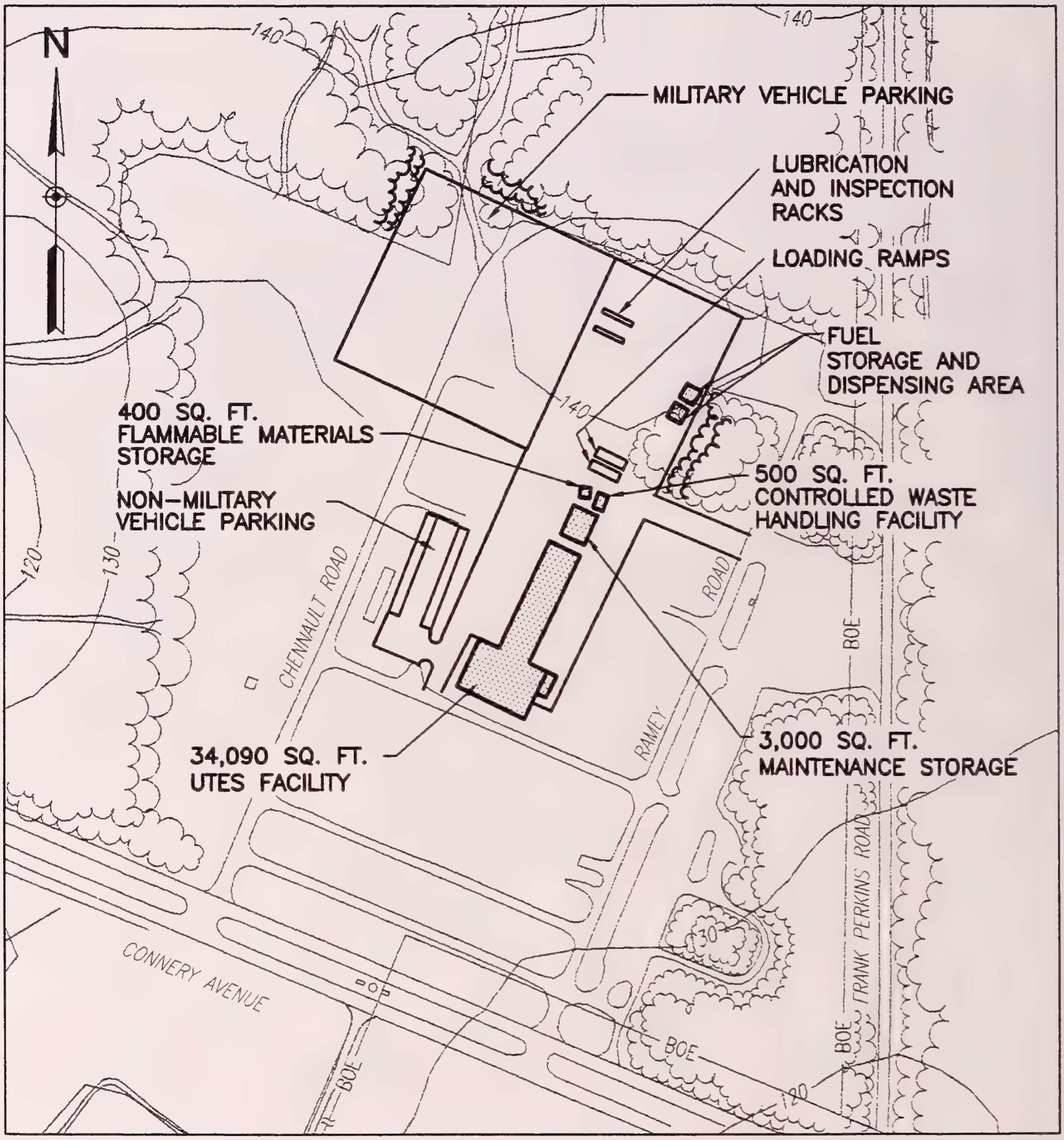
1"=300'

Source: Camp Edwards Training Site

UNIT TRAINING EQUIPMENT SITE PROJECT ALTERNATIVE 1

File Name: J:\6650-14\6650F006.DWG

Figure 2-23


N
MILITARY VEHICLE PARKING
LUBRICATION AND INSPECTION RACKS
LOADING RAMPS
FUEL STORAGE AND DISPENSING AREA
400 SQ. FT. FLAMMABLE MATERIALS STORAGE
NON-MILITARY VEHICLE PARKING
500 SQ. FT. CONTROLLED WASTE HANDLING FACILITY
3,000 SQ. FT. MAINTENANCE STORAGE
34,090 SQ. FT. UTES FACILITY
CHENNAULT ROAD
RAMEY ROAD
FRANK PERKINS ROAD
CONNERY AVENUE
BOE
140
130
120

LEGEND

▨ PROPOSED UTES FACILITIES

— BOE — EXISTING BASE OVERHEAD ELECTRIC DISTRIBUTION

PROPOSED WOODED AREA

EXISTING WOODED AREA

0 150 300 FEET

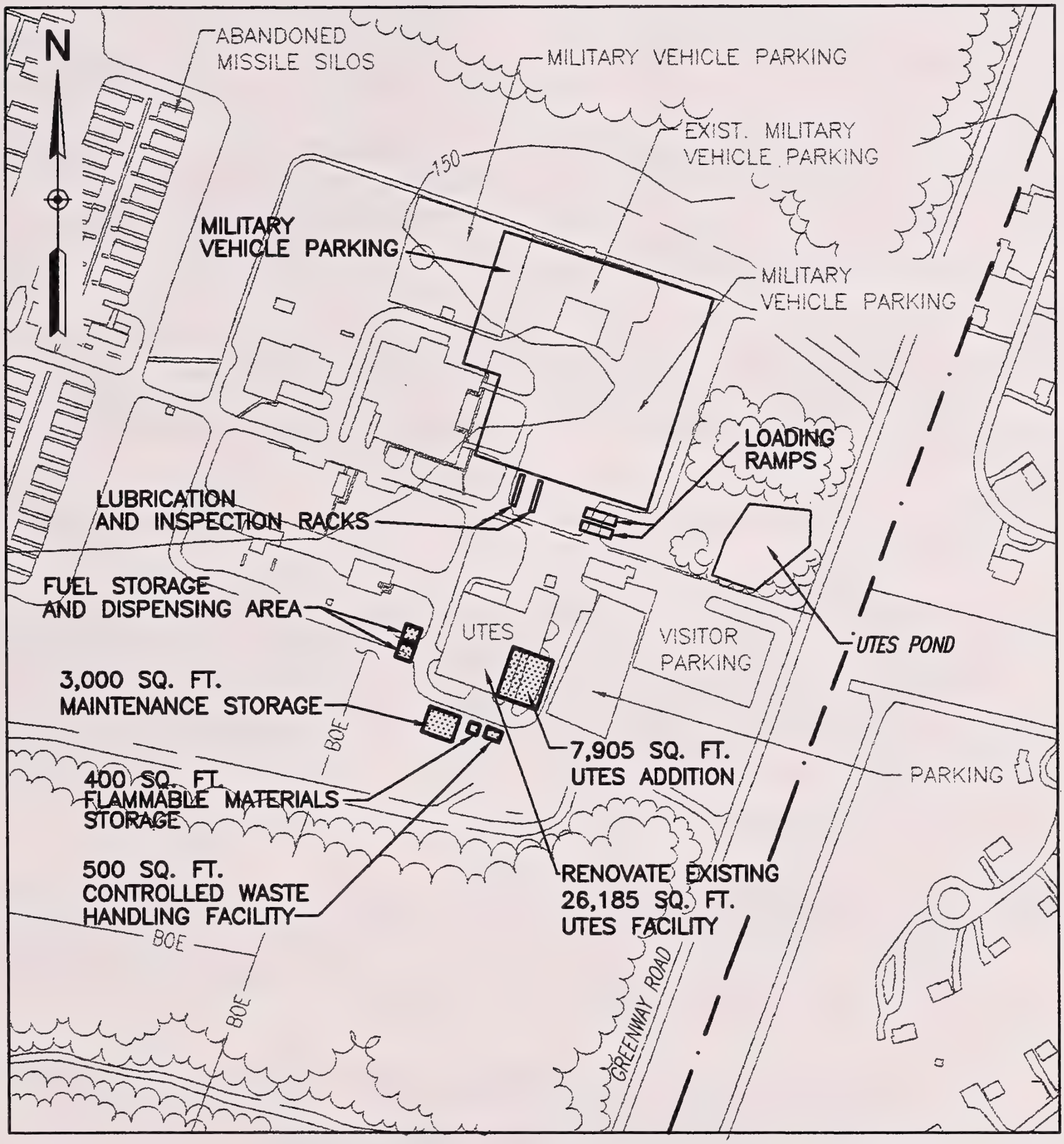
1"=300'

Source: Camp Edwards Training Site

UNIT TRAINING EQUIPMENT SITE PROJECT ALTERNATIVE 2

File Name: J:\6650-14\6650F007.DWG

Figure 2-24


N
ABANDONED MISSILE SILOS
MILITARY VEHICLE PARKING
EXIST. MILITARY VEHICLE PARKING
150
MILITARY VEHICLE PARKING
MILITARY VEHICLE PARKING
LOADING RAMPS
LUBRICATION AND INSPECTION RACKS
FUEL STORAGE AND DISPENSING AREA
UTES
VISITOR PARKING
UTES POND
3,000 SQ. FT. MAINTENANCE STORAGE
BOE
7,905 SQ. FT. UTES ADDITION
PARKING
400 SQ. FT. FLAMMABLE MATERIALS STORAGE
500 SQ. FT. CONTROLLED WASTE HANDLING FACILITY
RENOVATE EXISTING 26,185 SQ. FT. UTES FACILITY
BOE
BOE
GREENWAY ROAD

LEGEND

▨ PROPOSED UTES FACILITIES
— · — — INSTALLATION BOUNDARY
⌒⌒⌒ EXISTING WOODED AREA
— BOE — EXISTING BASE OVERHEAD ELECTRIC DISTRIBUTION

0 150 300 FEET
1"=300'

Source: Camp Edwards Training Site

UNIT TRAINING EQUIPMENT SITE
PROJECT ALTERNATIVE 3

File Name: J:\6650-14\6650F009.DWG

Figure 2-25

Alternative 2. Under this alternative, the UTES facility would be constructed in the 3600 Area of Camp Edwards (Figure 2-24). This location is near the training area, does not appear to present IRP conflicts, and is close to existing paved and unpaved training site roads. However, this location is removed further from the training area and the existing vehicle washrack and fuel dispensing site.

Alternative 3. Alternative 3 would involve renovating the existing UTES to provide a more modern, useable facility with adequate shop space and ancillary facilities (Figure 2-25). This location is near the training area, is close to the existing vehicle washrack and fuel dispensing site, and is close to existing paved and unpaved training site roads.

This location could present conflicts with ongoing remediation efforts associated with IRP Site CS-10.

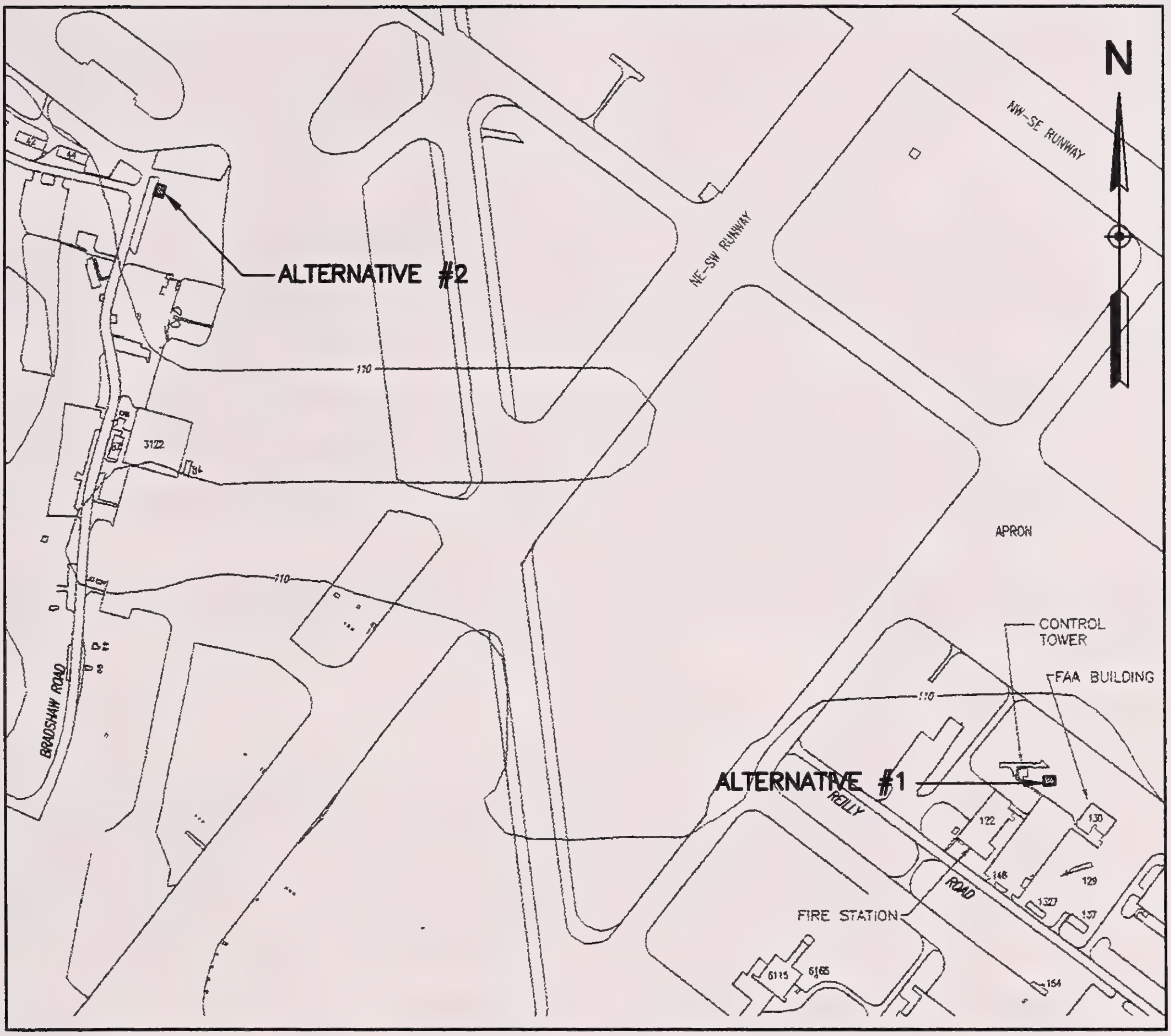
No Action Alternative. The No Action Alternative would involve the continued use of the existing UTES facility with no new construction or renovation. Implementation of the No Action Alternative would provide for continued access to the vehicle washrack and fuel dispensing site, and is close to existing paved and unpaved training site roads. This alternative does not provide for a modernized facility equipped to efficiently maintain and store the current equipment used by MAARNG.

2.6.2.2 Airfield Control Tower

Alternative 1. The Airfield Control Tower would be constructed immediately next to the existing control tower (Figure 2-26). This site provides a clear line of site to the entire airfield and would be in accordance with FAA and USAF AICUZ guidelines. This site also provides access to existing utility services; however, a new security fence would be necessary. The existing control tower would be demolished.

Alternative 2. This alternative would require construction of the proposed Control Tower north of Building 3122 (see Figure 2-26). This location provides a clear line of sight to the entire runway and would allow access to existing utility services. This location would be in accordance with FAA and USAF AICUZ guidelines. A new security fence would also be required. The existing control tower would be demolished.

No Action Alternative. The No Action Alternative would involve no new construction and continued use of the existing tower and equipment. The existing tower would remain within a USAF AICUZ flight safety zone, equipment upgrade would not be possible, and structural and safety improvements would not be achieved.



LEGEND

▨ PROPOSED AIRFIELD CONTROL TOWER PROJECT ALTERNATIVES

0 250 500 FEET
1"=500'

Source: Otis ANGB

AIRFIELD CONTROL TOWER PROJECT ALTERNATIVES 1 & 2

File Name: J:\6650-14\6650F002.DWG

Figure 2-26

2.6.2.3 Aircraft Generation Unit Facility

Alternative 1. The proposed AGU would be sited approximately 150 ft southwest of Building 158 in the area currently occupied by the aircraft parking area known as Able Row (Figure 2-27). This site provides direct access to the taxiway/runway and to the main hangar (Building 158) for long-term maintenance requirements.

Alternative 2. The proposed AGU would require the demolition of Building 163 and construction of the AGU in its place (see Figure 2-27). Building 163 is an empty aircraft hangar that is currently used for cold storage. This site provides direct access to the parking apron and utility services and is centrally located to other maintenance facilities.

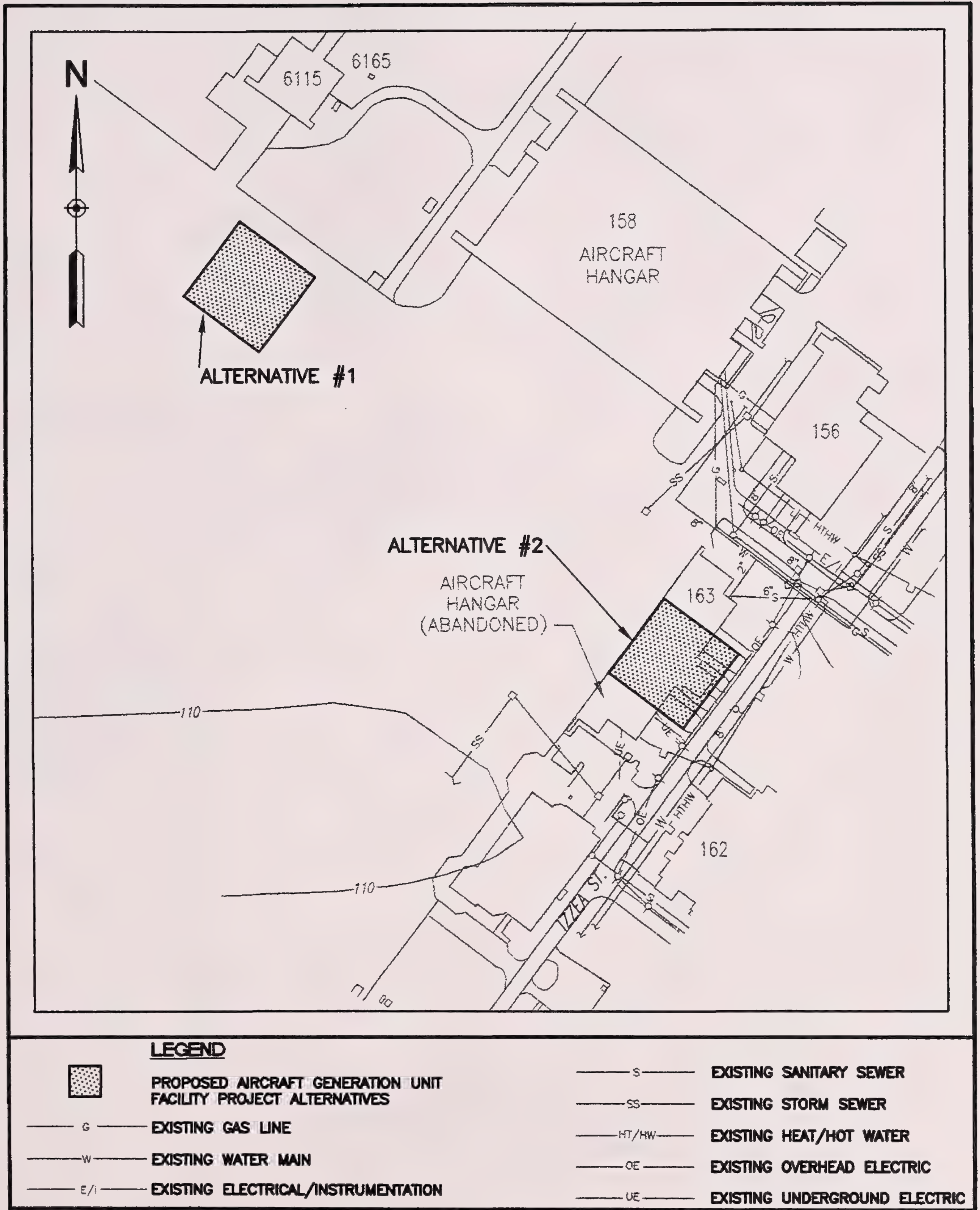
No Action Alternative. The No Action Alternative would involve no new construction and the continued sharing of shop space with the Consolidated Aircraft Maintenance Section in Building 158.

2.6.2.4 Fire Station

Alternative 1. A new Fire Station would be constructed along the flight line as close to the existing fire station as possible (Figure 2-28). The preferred location is SE of the existing fire station where Building 128 is currently located. This location provides flightline access with clear sight and direction to all flightline facilities and flying agencies. Existing utilities are readily available. Building 128, was constructed in 1954 and would be demolished. In addition, the existing Fire Station would also be demolished.

Alternative 2. A new fire station would be constructed west of the airfield where Building 3122 is currently located (Figure 2-29). Building 3122 was constructed in 1942 and is a vacant administrative facility that is scheduled for demolition because of its deteriorated condition. This location provides direct access to the airfield and easy access to all areas of MMR, including the military family housing area in the southwest portion of the installation. This alternative would eliminate the need for the existing satellite fire station located in the family housing area. If this alternative is selected, the facility would total approximately 27,000 square feet (as opposed to 25,000 square feet for other alternatives) because this alternative would require 16 fire apparatus bays (rather than 14) to house the two vehicles currently located in the satellite fire station).

Alternative 3. Under this alternative, a new Fire Station would be constructed along the flightline where Building 126 is currently located (see Figure 2-29). This location also provides immediate flightline access, clear sight and direction to all flightline facilities and flying agencies, and utility access. Building 126, was constructed in 1954 and would be demolished. In addition, the existing Fire Station would also be demolished.


N
6115
6165
158
AIRCRAFT
HANGAR
ALTERNATIVE #1
156
ALTERNATIVE #2
AIRCRAFT
HANGAR
(ABANDONED)
163
110
110
162
IZZEA ST.
SS
G
S
W
HTHW
E/I
OE
UE
8"
6"S
2"
LEGEND
PROPOSED AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVES
G EXISTING GAS LINE
W EXISTING WATER MAIN
E/I EXISTING ELECTRICAL/INSTRUMENTATION
S EXISTING SANITARY SEWER
SS EXISTING STORM SEWER
HT/HW EXISTING HEAT/HOT WATER
OE EXISTING OVERHEAD ELECTRIC
UE EXISTING UNDERGROUND ELECTRIC

0 100 200 FEET

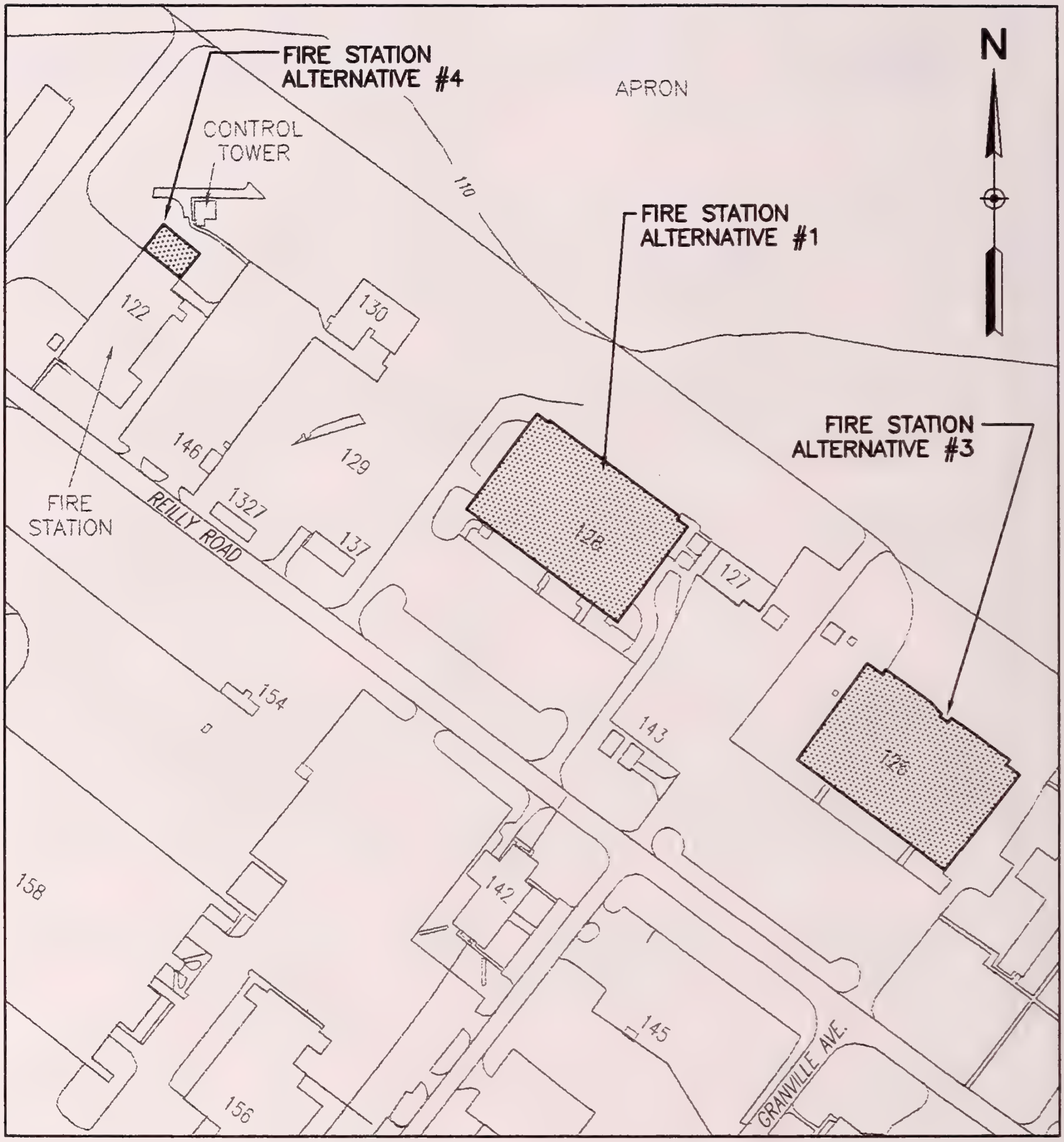
1"=200'

Source: Otis ANGB

AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVES 1 & 2

File Name: J:\6650-14\6650F005.DWG

Figure 2-27



LEGEND

▨ PROPOSED FIRE STATION PROJECT ALTERNATIVE

—— 110 —— EXISTING CONTOUR

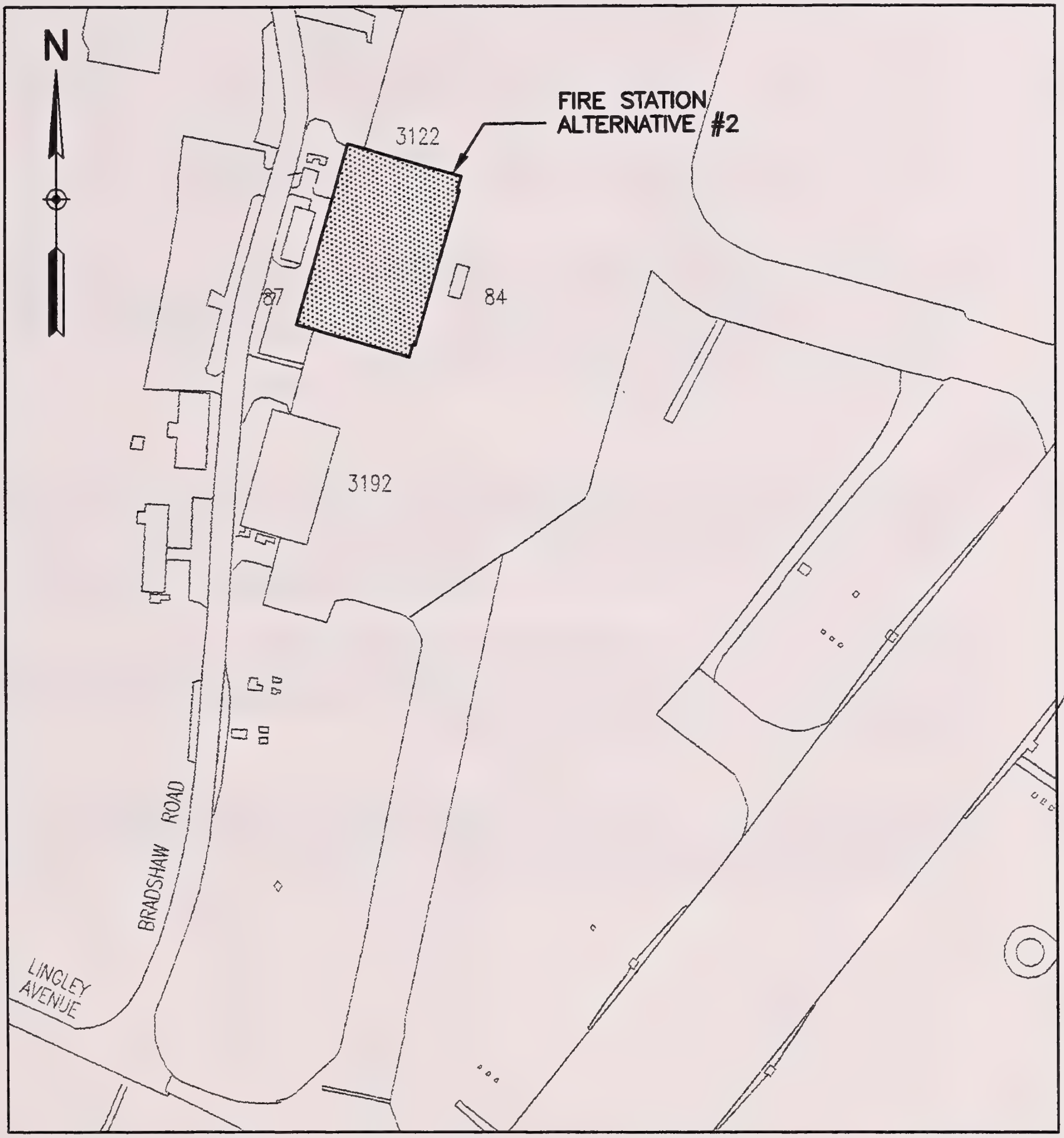
0 100 200 FEET
1"=200'

Source: Otis ANGB

FIRE STATION PROJECT ALTERNATIVES 1, 3 & 4

File Name: J:\6650-14\6650F033.DWG

Figure 2-28



LEGEND

▨ PROPOSED FIRE STATION

0 100 200 FEET

1"=200'

Source: Otis ANGB

**FIRE STATION PROJECT
ALTERNATIVE 2**

File Name: J:\6650-14\6650F049.DWG

Figure 2-29

Alternative 4. The proposed addition would be immediately adjacent to the existing fire station, where fire personnel and equipment are currently housed (see Figure 2-28).

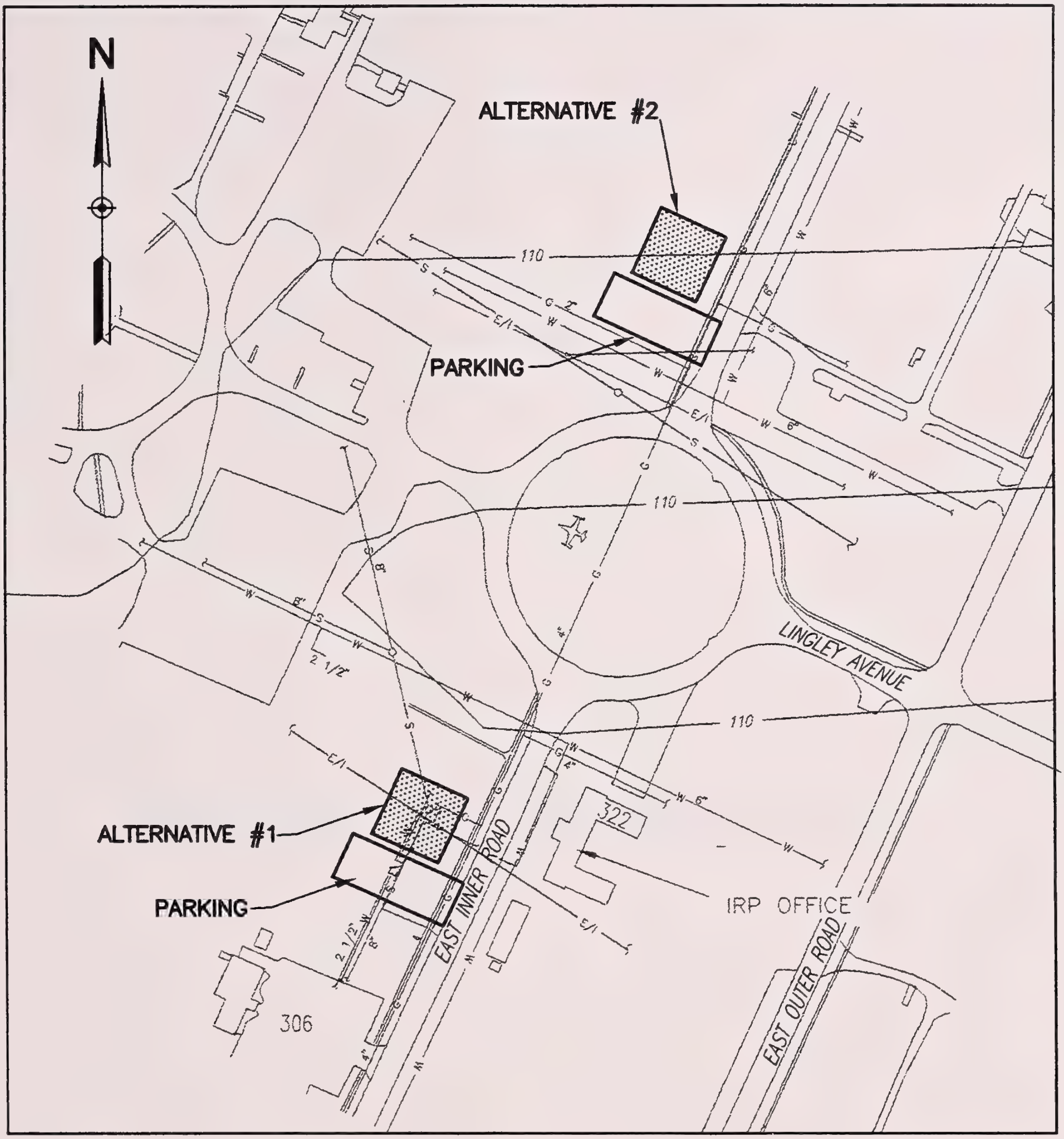
No Action Alternative. The No Action Alternative would involve no new construction (new facility or addition) and continued use of the existing facility which is inadequate in terms of fire vehicle parking and classroom areas. The current fire station would continue to operate in violation of National Fire Protection Association and Occupational Safety and Health Administration requirements.

2.6.2.5 Environmental Facility

Alternative 1. The proposed Environmental Facility would be constructed south of the Lingley Avenue/East Inner Road rotary directly across from the existing IRP office (Figure 2-30). This site provides a central location and is easily accessible to the public via all gates. In addition, utility access and adequate space for parking would be available.

Alternative 2. Under this alternative, the proposed Environmental Facility would be constructed north of the rotary along East Inner Road (see Figure 2-30). This site also provides a central location and is easily accessible to the public. In addition, utility access and adequate space for parking would be available.

No Action Alternative. The No Action Alternative would involve no new construction and continued use of several different buildings situated throughout Camp Edwards at Otis ANGB to accommodate the administrative and laboratory functions of the various environmental offices at MMR.



LEGEND

▨ PROPOSED ENVIRONMENTAL FACILITY PROJECT ALTERNATIVES

——G—— EXISTING GAS LINE

——W—— EXISTING WATER MAIN

——E/I—— EXISTING ELECTRICAL/INSTRUMENTATION

——S—— EXISTING SANITARY SEWER

0 100 200 FEET

1"=200'

Source: Otis ANGB

ENVIRONMENTAL FACILITY PROJECT ALTERNATIVES 1 & 2

File Name: J:\6650-14\6650F003.DWG

Figure 2-30

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3.0 AFFECTED ENVIRONMENT - MMR

3.1 Introduction

This chapter provides baseline information against which environmental impacts associated with the proposed projects described in Section 2.0 will be evaluated. This chapter is divided into five major categories: 1) Background Description of MMR; 2) Physical Environment (climate, air quality, noise, earth resources, and water resources); 3) Biological Environment (vegetation, fish and wildlife, and threatened or endangered species); 4) Social Environment (land use development, cultural resources, hazardous materials and hazardous waste management, utilities, and transportation); and 5) Economic Environment.

3.2 Background Description of MMR

Since 1911, MMR has hosted training and operational activities associated with active or reserve units representing all branches of the U.S. armed services. U.S. Army activity during World War II (1940-1944) and USAF air defense operations from 1955 to 1970 were the greatest periods of intensive activity at MMR. In addition to currently hosting MAARNG (Camp Edwards Training Site), MAANG (Otis ANGB), USCG (Air Station Cape Cod), USAF (Cape Cod Air Station), and the VA, MMR hosts several smaller activities associated with the USMC, USDA, FAA, an independent DoD contractor (Textron Cape Operations), and the Otis Fish and Game Club.

This section presents the history and use of MMR and describes the current installation activities, utilization, and operations of MMR.

3.2.1 Installation History

1935 - 1950

MMR was established in 1935 by the Commonwealth of Massachusetts for the purpose of National Guard and Army Reserve training and was designated Camp Edwards in recognition of Major General Clarence Edwards, the Commander of the 26th (YANKEE) Infantry Division during World War I. A grass airstrip was established and named Otis Field for 1st LT F.J. Otis, a physician killed in an aircraft accident while serving as a Massachusetts National Guard pilot. A portion of the range and maneuver areas was acquired from the Shawme-Crowell State Forest, and the cantonment area and a portion of the range and maneuver areas were purchased from private sources. The majority of the land forming MMR came from the Coonamesset Sheep Ranch.

During the period from 1935 to 1940, the Commonwealth of Massachusetts and the federal government constructed 63 buildings and two turfed runways approximately 3,800 ft long. In 1940 the Commonwealth of Massachusetts and the U.S. Army entered into a 99-year lease, at which time the U.S. Army initiated construction of an expanded facility to accommodate up to 30,000 troops and a 1,722-bed hospital complex.

During the first two years of World War II, the 26th Infantry and a portion of the American Division trained at MMR before embarking for Europe and the South Pacific. In addition, several other major units or activities occupied MMR during World War II: the 14th Anti-Submarine Patrol Squadron operated from Otis Field from 1941 to 1945; the Second Battalion 64th Coastal Artillery Regiment was stationed at Camp Edwards from 1942 to 1945; and the Army Engineering Amphibious Command occupied Camp Edwards and used the beaches of Cape Cod, Martha's Vineyard, and Nantucket to train troops for amphibious assault. In 1943 the East Coast Processing Center was moved to Camp Edwards, and until 1945 up to 5,000 prisoners of war were interned at MMR. At the end of World War II, Camp Edwards was used as an outprocessing center for U.S. troops.

In 1944 Otis Field was placed under U.S. Navy (USN) control (Naval Air Station, Quonset Point, Rhode Island) and renamed Naval Auxiliary Air Facility-Otis Field. Aircraft facilities were expanded to provide three 7,000-foot long runways and additional aircraft parking, dispersal, and taxi areas. Naval Auxiliary Air Facility-Otis Field was deactivated by the USN in 1945.

From 1945 to 1970 the military hospital was one of the Army's largest hospital units. During the early 1970s the hospital buildings were demolished when Otis Air Force Base (AFB) was transferred to MAANG. Control of the former hospital site has been transferred to the VA.

In 1946 Camp Edwards was deactivated, and MMR was used primarily for training activities from 1946 to 1948. In 1948 the USAF obtained control of Otis Field for an air defense mission and assignment of a fighter interceptor unit. At this time, one runway was extended to increase its length to 8,000 ft.

1950 - 1970

Camp Edwards was reactivated in 1950 to support the U.S. Army mission during the Korean Conflict. In 1953 the USAF established Otis AFB, and selected facilities were transferred from the Department of the Army to the Department of the Air Force. This action also involved the acquisition and operational control of utility systems, communications facilities, supply facilities, fire protection, and the hospital that were previously operated by Camp Edwards.

The MAANG Permanent Field Training Site (PFTS) was established in 1954 to provide the necessary training facilities for MAANG units performing 15-day annual field training. Many units came from across the country for training at Otis AFB, one of five bases nationwide having a PFTS. Approximately 8,000 troops trained annually during July and August. The PFTS was deactivated in April 1973.

In 1955, the 551st Airborne Early Warning and Control Wing (AEW&C) and its 45 EC-121 Super Constellation aircraft were assigned to Otis AFB. From 1955 to 1970, AEW&C maintained 20 aircraft in the air at all times to provide protection for the East Coast. The 60th Fighter-Interceptor Squadron was also assigned to Otis AFB in 1955.

In 1956 the USAF negotiated a 99-year lease with the Commonwealth of Massachusetts for approximately 21,000 acres which included Otis Field and Camp Edwards. Subsequently, Runway 14/32 (the cross-wind runway) was extended from 7,000 ft to 9,500 ft. In addition, a new control tower, fire station, aviation support facilities, and a 1,993-unit family housing area were constructed. The USAF granted the U.S. Army a permit to use approximately 14,000 acres located primarily north of the airfield. Camp Edwards, with its mission to support reserve component training from 1954 to 1974, consisted primarily of the range and training areas and two battalion-sized areas of World War II-era buildings.

In 1962, the 26th Air Defense Missile Squadron was activated and the BOMARC missile facility was located at Otis AFB. The BOMARC facility, operated under Strategic Air Command control by Boeing Corporation, was deactivated in 1972.

Since 1968, Otis AFB has hosted a number of additional units. The 102nd Fighter-Interceptor Wing of MAANG relocated to Otis AFB from Logan International Airport in 1968. The 4713th Defense Systems Evaluation Squadron was added in 1970 after the 551st AEW&C was deactivated due to a planned phase-out of certain units of the Aerospace Defense Command. With the deactivation of the 551st AEW&C Wing, the 4784th Air Base Group assumed the role of host unit in 1970. Also in 1970, the USCG relocated to Otis AFB and commissioned the USCG Air Station Cape Cod.

1970 - Present

In December 1973 the 4784th Air Base Group was deactivated, and the 4789th Air Base Group was formed to act as caretaker for the USAF and to operate the base utility systems. Also at this time, the 102nd Fighter-Interceptor Wing became the airfield manager and the U.S. Army began withdrawal of its Camp Edwards Garrision. MAARNG assumed operational control of Camp Edwards in 1975 to provide IDT and AT for National Guard and Army Reserve units. Otis AFB was officially designated Otis ANGB on October 1, 1980.

The Cape Cod Air Station was established in 1978 for the detection of sea-launched ballistic missiles and acquiring and tracking orbiting satellites. This unit consists of radar and support facilities and is operated for the USAF Space Command by the 6th Missile Warning Squadron and the 2165th Communication Squadron. The radar system is more commonly known as PAVE-PAWS.

During July 1979, the U.S. Army licensed its area at Camp Edwards to the Commonwealth of Massachusetts to use and occupy for year-round training and support of MAARNG. Camp Edwards remains an important facility for National Guard and Reserve units because its 14,700 acres provides the only site within New England large enough for battalion and company sized training and the only artillery range east of Fort Drum, New York.

From 1976 to 1984, the federal licensing documents for MMR (Department of the Army Contract Agreement [DACA] 51-5-75-293, DACA 51-5-77-127, and DACA 51-3-79-394) were modified and land was transferred between the Army and the Air Force to accommodate changes in basic mission and requirements for land and training facilities.

The 253rd Combat Communications Group and the 267th Combat Communications Squadron of MAANG relocated to Otis ANGB from Wellesley, Massachusetts, in July 1996.

Each of the three agencies--Army, Air Force, and Coast Guard--are separate and distinct lessors from the Commonwealth of Massachusetts. The USAF retains control of its lease area, but has delegated the operational aspects of its mission to MAANG. The U.S. Army has licensed its area to MAARNG, but maintains considerable oversight and may assign units to train at Camp Edwards, as necessary. This situation is unlike most military bases where one agency acts as the host and all other agencies are tenants.

Finally, six non-military operations are located at MMR. The USDA has operated a Research Laboratory since 1960. Textron Cape Operations, a private defense contractor, has operated a weapons and detection systems research and development facility since 1968. In 1978 the VA began to develop the National Cemetery of Massachusetts, which has been in operation since 1980. The FAA operates the Cape Approach Control Activity from its facility (Building 130) at Otis ANGB. The Otis Fish and Game Club operates a recreational facility including skeet ranges used for practice and competition. The Otis Fish and Game Club also supports the Deer Management Program in conjunction with the Massachusetts Division of Fisheries and Wildlife. In addition, the town of Bourne operates four schools within the MMR boundary. However, Bourne public schools are not tenants on MMR, and are not discussed further in this EIS/EIR.

3.2.2 Current Installation Activities

This subsection introduces the occupants of MMR, their mission, and installation activities.

3.2.2.1 Massachusetts Army National Guard

MAARNG currently conducts a variety of training and operational activities at MMR. The primary activity consists of the Camp Edwards Training Site, which is the primary training site for MAARNG and regional units of the Army Reserve. The Camp's facilities are also used for training by other reserve components from Maine, New Hampshire and Connecticut. Occasionally units from New York, Vermont, New Jersey, Pennsylvania, West Virginia and Alabama conduct training at MMR. In addition, vehicles and aircraft assigned to MAARNG units stationed on and off the installation are maintained at MMR.

As discussed in Section 3.2, a number of other government agencies or contractors use facilities that are licensed from Camp Edwards. Under the provisions of the license granted to Camp Edwards, MAARNG has licensed land and/or buildings to the USDA, USMC and Textron Cape Operations.

U.S. Marine Corps. The USMC includes an active component of the Instructor/Inspector Group and a reserve component of the 1st Battalion, 25th Marines. The Instructor/Inspector staff of the USMC is responsible for the training and evaluation of the 1st Battalion, 25th Marines, USMC stationed at MMR. The mission of the battalion is to locate and destroy the enemy, fire and maneuver, and to repel assault by fire and close combat. In addition, a USMC Reserve operates at MMR under an Interservice Service Support Agreement established with MAARNG. The Interservice Service Support Agreement is renewed every four years.

U.S. Department of Agriculture. The USDA Otis Methods Development Center is a division of the Animal and Plant Health Inspection Service with Headquarters in Washington, D.C. The Center provides national research support for plant protection programs, as well as the development of environmentally sound control methods for the gypsy moth, alfalfa weevil, Colorado potato beetle, and other insect pests.

Textron Cape Operations. Textron Cape Operations develops and tests tactical weapon systems for the U.S. Army and USAF. In addition to loading, assembly, and explosive testing of developmental tactical ordinances, other activities at the Textron Cape Operations facility include evaluation of warhead deployment techniques such as parachute drop, launcher deployment, and on-board sensor evaluation. These system tests are generally conducted within non-explosive warhead simulators to minimize hazards and to remain within range safety zones.

Otis Fish and Game Club. The Otis Fish and Game Club is located NE of the main gate adjacent to Route 28. The fish and game club is an organization of mainly retired military personnel who use the MAARNG property, including one small arms range and archery trails for target practice and competitions. This property is managed by Camp Edwards Range Control.

3.2.2.2 Massachusetts Air National Guard

Otis ANGB occupies approximately 3,600 acres of land on MMR. The host unit at Otis ANGB is the 102nd Fighter Wing, which operates and maintains a squadron of F-15 fighter aircraft. The mission of the 102nd is to protect the northeastern U.S. from armed attack, terrorist activities, and illegal activities (i.e., drug trafficking and smuggling); to detect, identify, and monitor air traffic approaching and entering the sovereign airspace of the northeastern U.S.; to conduct surveillance of hijacked aircraft; to assist aircraft in distress; and to assist civil authorities in times of disaster and crisis.

In addition to the 102nd, Otis ANGB is also home to MAANG Headquarters, the 202nd Weather Flight, 567th USAF Band, 253rd Combat Communications Group, and the 267th Combat Communications Squadron.

3.2.2.3 U.S. Coast Guard

USCG activities on MMR include Air Station Cape Cod, the Transmitter Site, and six other units performing various missions. Air Station Cape Cod provides medium-range search and recovery support of the 1st Coast Guard District and Atlantic Area, and provides housing and support activities for military personnel and their families in all five services stationed in southeastern Massachusetts. Transmitter Site personnel provide operation and maintenance of transmitters and antennas for Communications Station Boston.

3.2.2.4 U.S. Air Force, 6th Space Warning Squadron

The mission of this squadron is the detection and warning of a sea-launched ballistic missile attack against the U.S. and Canada. This unit also provides for the detection and warning of an intercontinental ballistic missile attack against the continental U.S. and southern Canada, and provides surveillance, tracking, reporting, and limited space object identification.

3.2.2.5 Department of Veterans Affairs (National Cemetery)

This department maintains the cemetery, and conducts burials, ceremonies and special events. Internment is available to eligible veterans and dependents.

3.2.2.6 Federal Aviation Administration

The FAA operates its Cape Approach Control for Cape Cod and the islands from its existing facility at Otis ANGB, by providing local air space management for all aircraft within a 60-mile radius of the airfield.

3.2.2.7 Other Activities

Other activities located on MMR include the Bourne Schools, the solid waste transfer station, and a bicycle motor-cross track.

3.2.3 Current Utilization and Operations

This section presents an overview of Camp Edwards and Otis ANGB operations with the number of personnel who are employed or train at MMR.

3.2.3.1 MMR Utilization

MMR is primarily a training site for MAARNG and MAANG personnel; however, approximately 70 percent of MMR's permanent population is composed of family members of full-time USCG staff and personnel associated with the other occupants who use MMR. Table 3-1 lists full- and part-time military, civilian, and transient personnel who used MMR in 1994.

Because the population at Camp Edwards varies according to training activities, a detailed discussion of Camp Edwards utilization is provided below in Section 3.2.3.2.

3.2.3.2 Camp Edwards

Camp Edwards is the principal training site for MAARNG and for other regional Army reserve units. Camp Edwards is also used by several other New England state Army National Guards, including units from Rhode Island, New Hampshire, Connecticut and Vermont. Facilities at Camp Edwards are also used by civilian law enforcement agencies such as local police departments and Massachusetts State Police, and federal law enforcement agencies such as U.S. Customs; Bureau of Alcohol, Tobacco, and Firearms; U.S. Drug Enforcement Agency; the Internal Revenue Service; and U.S. Marshal's Service. Other local civilian uses of MMR include the Civil Air Patrol, the World War II Society, the Youth Conservation Corps, and school and adult/youth sports events.

Table 3-1
MMR Employment and Base Population (1995)

Occupant	Total Personnel	Full-Time Personnel	Part-Time Personnel	Personnel Living On-Base
Massachusetts Air National Guard	1,435	700	735	0
Massachusetts Army National Guard	299[1]	59	240	0
United States Coast Guard	524	379	145	503[2]
United States Marine Corps	24	24	0	23
United States Air Force, 6th Warning Squadron	126	126	0	0
Federal Aviation Administration	N/A	N/A	N/A	N/A
National Cemetery, Dept. of Veterans Affairs	22	21	1	0
United States Department of Agriculture	30	29	1	0
Textron Cape Operations	9	3	6	0
Otis Fish and Game Club	n/a	n/a	n/a	0
TOTAL	2,469	1,341	1,128	526

[1] Personnel that provide support to units training at Camp Edwards.
[2] Includes 324 Coast Guard personnel living at MMR, but assigned to another unit.

N/A Not available

Source: MMR Utilization Questionnaire completed by MMR occupants, February 1996.

The Adjutant General of the Massachusetts National Guard has limited the use of Camp Edwards for training purposes to 3,000 personnel per day. This restriction represents the reasonable capacity for the number of troops that could be accommodated in the training and cantonment areas of Camp Edwards while maintaining the ability to realistically meet training goals. Because civilian use is limited by the availability of specific firing ranges, there is no maximum ceiling for civilian use of the training site. Civilian use is included within this 3,000-person limit.

Based on the historic annual average use of Camp Edwards for military training (137 days), and the limited daily troop capacity (3,000), the maximum annual utilization of Camp Edwards by military personnel for training purposes would be 411,000 man-days (a man-day is one day of work by one person). However, historic use of Camp Edwards has never approached the maximum annual utilization capacity. Table 3-2 presents the total utilization of Camp Edwards in 1994, including both military and civilian use. In 1994 total utilization of Camp Edwards was approximately 260,000 man-days. This represents approximately 63 percent of the maximum annual utilization (411,000 man-days) of Camp Edwards. The most utilized month in 1994 was June, which accounted for approximately 51,400 man-days (20 percent of the total 1994 use); the least utilized month was February which accounted for approximately 10,500 man-days (4 percent of the total 1994 use).

Table 3-2
FY 1994 Camp Edwards Utilization (Man-days)

	Oct. 1993	Nov. 1993	Dec. 1993	Jan. 1994	Feb. 1994	Mar. 1994	Apr. 1994	May 1994	Jun. 1994	Jul. 1994	Aug. 1994	Sept. 1994	Annual Utilization
Full-Time Support													
Camp Edwards	4,300	4,300	4,300	4,060	4,300	4,300	4,300	3,620	3,620	3,620	3,620	3,620	47,960
Other Occupants	1,600	1,600	1,600	1,600	1,600	1,604	800	800	800	800	845	800	14,449
Total	**5,900**	**5,900**	**5,900**	**5,660**	**5,900**	**5,904**	**5,100**	**4,420**	**4,420**	**4,420**	**4,465**	**4,420**	**62,409**
Training Units													
MAARNG	12,344	9,357	3,346	4,812	4,192	10,846	11,603	10,145	43,695	16,088	6,353	9,469	142,250
Other ARNG	787	0	0	22	3	883	2,148	877	2,173	15,138	6,030	3,573	31,634
USAF	132	541	74	61	56	851	1,130	250	2	13	207	642	3,959
MAANG	38	90	98	13	27	13	487	1,302	92	152	110	42	2,464
Other Res. Comp.	230	259	1,701	127	311	416	590	57	444	25	220	658	5,036
Active Army	218	117	342	3	7	19	411	59	206	283	168	78	1,909
Active Navy	0	0	0	0	0	0	0	0	0	0	82	6	88
Military Total	**13,749**	**10,364**	**5,561**	**5,038**	**4,596**	**13,028**	**16,369**	**12,690**	**46,612**	**31,699**	**13,170**	**14,464**	**187,340**
Civilian Law Enf.	1,190	201	44	59	15	66	615	636	211	0	42	267	3,346
Other Civilian	264	541	106	16	34	159	20	90	179	2,532	2,140	222	6,303
Civilian Total	**1,454**	**742**	**150**	**75**	**49**	**225**	**635**	**726**	**390**	**2,532**	**2,182**	**489**	**9,649**
Total Training	**15,203**	**11,106**	**5,711**	**5,113**	**4,645**	**13,253**	**17,0004**	**13,416**	**47,002**	**34,231**	**15,352**	**14,953**	**196,989**
Total Utilization	**21,103**	**17,006**	**11,611**	**10,773**	**10,545**	**19,157**	**22,104**	**17,836**	**51,422**	**38,651**	**19,817**	**19,373**	**259,398**

Source: Camp Edwards, 1996.

Other factors also contribute to the less than maximum use of Camp Edwards. Military units do not train on all available weekends, and occasionally, training goals are met at other installations or at a unit's home armory. In addition, many units do not train at Camp Edwards from mid-November through mid-February because of local weather conditions. During many IDT and AT periods, the daily maximum training population limit of 3,000 soldiers is not reached.

The Army National Guard has developed a management database to assist trainers, facility managers, and environmental managers in managing land use at training sites. This database, the Range Facility Management Support System (RFMSS), will enable Army National Guard managers to more readily consider environmental factors in the scheduling of activities at training sites throughout the country. The database will store specific information for each training site such as frequency of use, types and number of weapons and ammunition used, equipment/aircraft used, and other pertinent information regarding the units using the installation. RFMSS can be integrated with environmental information stored in geographic information system (GIS) software. Because this database is relatable to a GIS, environmental factors (e.g., wetlands, threatened or endangered species or habitat, mating seasons, etc.) can be readily considered to minimize impact on the environment.

This management tool will assist in avoiding scheduling conflicts as well as provide actual data regarding training site use such as, number of personnel, hours worked, expenses incurred, and other pertinent information on units using the training sites.

3.3 Physical Environment

3.3.1 Climate

Typical climatic features of Cape Cod include variation of weather, daily and seasonal variation in temperature moderated by the ocean, unpredictable variations in seasons from year to year, and uniform distribution of precipitation (James M. Montgomery, 1991).

Precipitation in Massachusetts is evenly distributed throughout the year. Minor variations of this basic pattern occur on Cape Cod due to its proximity to the ocean.

Data collected between 1900 and 1980 show the annual rainfall at Cape Cod to be 48 inches, approximately 3 to 4 inches higher than the state average. Average monthly rainfall at MMR ranges from a normal low of 2.0 inches in June to a high of 4.8 inches in both January and August. Annual snowfall at Cape Cod is approximately 37 inches, with heaviest snowfall in January.

Cape Cod's average annual temperature is approximately 50 degrees Fahrenheit (°F). The coldest month of the year is January, with average temperatures of 30 °F. July is the warmest month with an average temperature of 71 °F. Because of Cape Cod's proximity to the ocean, daily and seasonal temperature ranges are less than areas further inland. A daily temperature variation of 13 to 16 °F is typical of the MMR vicinity as compared to inland locations, where ranges are 17 to 20 °F. A seasonal range of approximately 40 °F can be expected at MMR as compared to an inland range of 45 to 47 °F.

The prevailing (most frequent direction) winds at MMR are from the southwest during spring and summer months (April through October) and the NW during winter months (December through February). Annual average wind speeds at MMR are approximately 11 miles per hour (mph) although winds of 30 mph or higher can be expected on at least one day per month. Winds of gale force (>32 mph) can occur, but are more common and stronger during storm events in the winter months.

Thunderstorms accompanied by hail occur about 14 days a year, with most thunderstorms occurring in the summer months. Severe tropical storms and hurricanes that caused significant damage on Cape Cod occurred nine times between the years of 1938 and 1985. Wind gusts during a winter blizzard in 1978 were estimated at 80 mph on Cape Cod.

Fog can occur at any time of the year but is most frequent at MMR during the spring and summer months.

Atmospheric temperature generally decreases with height above the earth's surface. When the air temperature aloft is warmer than the air temperature just above the earth's surface, the situation is called an *inversion.* On clear nights with light winds, the area near MMR experiences ground-based inversions. During these conditions, air pollutants released within such layers disperse more slowly than without inversions.

Areas near MMR also experience inversion conditions associated with advection –or movement– of cool, marine air over warmer land surfaces. This condition, which occurs most often on sunny, mild spring days when there is a 15 to 20 °F temperature difference between the land and ocean surface, results in a limited layer within which pollutants can disperse.

3.3.2 Air Quality

This section presents ambient air quality standards and regulations, and summarizes the air quality at and near MMR.

3.3.2.1 Ambient Air Quality Standards

Air quality in a given location is defined as the concentration of various pollutants in the atmosphere, which are generally expressed in parts per million (ppm) or micrograms per cubic meter ($\mu g/m^3$). Air quality is determined by the type and amount of pollutants emitted into the atmosphere, the size and topography of the region, and the prevailing meteorological conditions. The significance of pollutant concentration is determined by comparison to federal and/or state ambient air quality standards. These standards represent the maximum concentrations of pollutants allowed for the protection of public health and welfare.

The CAA 1970 mandated that the USEPA establish National Ambient Air Quality Standards (NAAQS) for "criteria pollutants" based upon identifiable effects the pollutants may have on public health and welfare. The USEPA has promulgated standards for the following criteria pollutants:

- Sulfur dioxide (SO_2)
- Nitrogen dioxide (NO_2)
- Carbon monoxide (CO)
- Particulate Matter with a diameter of 10 microns (one millionth of one meter) or less (PM_{10})
- Ozone (O_3)
- Lead

Two classes of ambient air quality standards have been established 1) primary standards, which define levels of air quality which the USEPA has judged as necessary to protect public health, and 2) secondary standards, which define levels for protecting soils, vegetation, wildlife, and other aspects of public welfare. The Commonwealth of Massachusetts has adopted the NAAQS under 310 CMR 6.04. The federal and Massachusetts Ambient Air Quality Standards (MAAQS) are listed in Table 3-3.

3.3.2.2 Air Quality Regulations

Federal and state air pollution control regulations have been promulgated to provide for the attainment and maintenance of the NAAQS and to carry out the provisions of the CAA. The Massachusetts Department of Environmental Protection (MADEP) establishes and enforces regulations authorized under Massachusetts laws. MADEP has adopted many of the federal regulations and, in some cases, has adopted more stringent state standards. The majority of applicable federal regulations are in the CFR, Title 40. Corresponding Massachusetts regulations can be found in the CMR, Title 310.

Table 3-3
National and Massachusetts Ambient Air Quality Standards

	Concentration ($\mu g/m^3$)	
Pollutant/Averaging Time	**Primary ($\mu g/m^3$) (1)**	**Secondary ($\mu g/m^3$) (1)**
Sulfur Dioxide (SO_2)		
3-Hour	—	1,300
24-Hour	365	—
Annual	80	—
Nitrogen Dioxide (NO_2)		
1-Hour (2)	320	—
Annual	100	100
Carbon Monoxide (CO)		
1-Hour	40,000	40,000
8-Hour	10,000	10,000
Particulate Matter (PM_{10}) (3)		
24-Hour	150	150
Annual	50	50
Ozone (O_3) (4)		
1-Hour	240	240
Lead		
3 Months	1.5	1.5

1 National and Massachusetts standards, other than those based on annual or 3-month averages, are not to be exceeded more than once per year (except where noted).
2 MADEP Guideline value.
3 The particulate matter standard (measured as PM_{10}) is attained when the expected number of days per calendar year with a 24-hour average concentration above 150 $\mu g/m^3$ is less than or equal to one.
4 The ozone (O_3) standard is attained when expected number of days in calendar year with maximum hourly concentrations above 235 $\mu g/m^3$ is less than or equal to one.

MADEP also ensures emission source compliance with Massachusetts regulations by requiring that each applicable existing source with significant air emissions must be registered and that its emissions meet specified limits set in each source's operating permit. As specified in the various provisions of 310 CMR 7.00, MADEP's Comprehensive Plan Approval permitting program regulates the construction, substantial reconstruction or alteration of any facility that has the potential to cause or contribute to a condition of air pollution. Any facility not specifically exempted from the requirements of the regulations, and whose design and/or performance characteristics (including air emissions) exceed any of the applicability thresholds set forth therein, require a Plan Approval from MADEP. Any facility for which Plan Approval is required may be subject to either a Comprehensive Plan Application (Major or Non-major) or a Limited Plan Application. A Limited Plan Application is required for any facility where the construction, substantial reconstruction or alteration would increase potential emissions equal to or greater than one ton per year (TPY) and less than five TPY of either criteria pollutants or the sum of the emissions of all non-criteria pollutants.

The CAAA of 1990 contains several requirements for the preparation of an air emission inventory from stationary air pollution sources. Title I of the CAAA requires air pollution source owners located in O_3 non-attainment areas to prepare emission inventory analysis for submittal to local regulatory authorities. Title III of the CAAA requires air pollution sources that emit more than 10 TPY of a single hazardous air pollutant or 25 TPY of combined hazardous air pollutants to meet stringent emission control requirements. Based on the Title V requirements of the CAAA, Massachusetts has established a permit program which charges an annual fee based on actual annual air pollutant emissions (310 CMR 7.00, Appendix E).

In preparation for Title V operating permit requirements, air emissions inventories were conducted for Camp Edwards (MAARNG, 1994a), Otis ANGB (MAANG, 1995a) and Air Station Cape Cod (USCG, 1994) to identify sources of air pollution and estimate air emissions for calendar year 1993. MAARNG and MAANG are presently working individually with MADEP to comply with specific state stationary source air permitting requirements for each separate installation. Pursuant to 310 CMR 7.12, MAARNG submitted Camp Edward's source registration to MADEP in April 1996. Based on this submission, Camp Edwards' potential stationary source emissions are below major source threshold levels. In May 1996, MAANG submitted to MADEP its Comprehensive Plan Approval permit application for Otis ANGB. Under provisions of this permit application (pending MADEP approval), Otis ANGB will be regulated as a non-major source. USCG received MADEP approval of their Restricted Emissions Status Permit application in September 1996, which classifies Air Station Cape Cod as a synthetic minor.

3.3.2.3 Existing Air Quality Conditions

Section 107 of the 1977 CAAA requires the USEPA to publish a list of all geographic areas in compliance with the NAAQS, referred to as attainment areas. The geographic regions established for designating air quality status are known as air quality control regions (AQCR). The Commonwealth of Massachusetts is divided into four AQCRs.

MMR is located in the Southeastern Massachusetts AQCR 120. According to USEPA guidelines, an area with air quality better than the NAAQS is designated as being in attainment; areas with worse air quality are classified as nonattainment. In areas where insufficient monitoring data exist for USEPA to make a determination, the areas are designated as unclassified and are treated as attainment areas. The MADEP has classified AQCR 120 as nonattainment (serious) for O_3 and attainment or unclassified for all other criteria pollutants. The entire Commonwealth of Massachusetts has been designated as nonattainment for O_3. This designation has no impact on current MMR operations.

The existing air quality of a region is defined by air quality data and emissions information. Air quality data are obtained by examining air quality monitoring records from monitoring stations maintained by the Air Quality Surveillance Branch (AQSB), Division of Air Quality Control, MADEP. Information on pollutant concentrations measured for short-term (24-hours or less) and long-term (annual) averaging periods is taken from the monitoring records to characterize the existing air quality background of the area. Background ambient conditions include pollutant concentrations that are too small or transient to be modeled individually (i.e., automobiles, home heating units), but contribute to total ambient conditions.

The most recent comprehensive listing of air quality emissions associated with activities at MMR is based on information (air emissions inventories) collected in 1993. For purposes of this analysis, 1993 is used as the benchmark for air quality baseline conditions. In 1993 the AQSB maintained a public ambient air monitoring network of 39 stations located throughout the Commonwealth. The AQSB also oversaw an industrial ambient air monitoring network of 37 monitoring stations. The industrial ambient air quality network is comprised of monitoring stations operated by Massachusetts industries with facilities that potentially emit large quantities of criteria pollutants and are located to measure the maximum impact due to emissions from the industrial facility.

A limited amount of ambient air monitoring data is collected in the Cape Cod region because air quality in the Cape Cod region is generally good (with the exception of O_3) and not many local major air pollution sources exist. Monitors are typically located only in areas where major air pollutant sources exist or where air quality is generally poor. In 1993 MADEP operated six monitoring sites within AQCR 120; however, not all criteria pollutants were monitored. The monitoring sites and pollutants measured include Fall River (SO_2, PM_{10}), Easton (O_3), Fairhaven (O_3), New Bedford (PM_{10}), Scituate (O_3), and Truro (O_3). MADEP also obtained and reviewed SO_2 data collected by New England Power in Fall River and Swansea in 1993. MADEP did not maintain or oversee any monitoring sites for NO_2, CO, and lead within AQCR 120 in 1993.

The background air quality concentrations presented in this EIS/EIR are based on the ambient monitoring data collected, reviewed and reported by MADEP (MADEP, 1993). Because limited or no ambient air quality monitoring data exists for criteria pollutants on Cape Cod, other Massachusetts monitoring site data that represents the ambient conditions found in the MMR region are being used. Table 3-4 summarizes the highest short-term or annual average concentrations reported for each criteria pollutant in 1993 that will be used to conservatively represent the background ambient air quality in the MMR area. The actual air quality in the MMR area is better than what is represented in Table 3-4. This information is presented as background data only, and is not used for analysis within this EIS/EIR.

Table 3-4
Background Ambient Air Quality Monitoring Data

Pollutant	Averaging Period	Measured Concentration (ppm)	Background Concentration ($\mu g/m^3$)	Site Location
Nitrogen Dioxide (NO_2)	Annual	0.028	52.8	Worcester Site #25-027-0020
Carbon Monoxide (CO)	1-Hour	11.6	13,296	Worcester Site #25-027-0020
CO	8-Hour	8.3	9,513	Worcester Site #25-027-0020
Inhalable Particulates (PM_{10})	Annual	—	18.0	Fall River Site #25-005-3001
PM_{10}	24-Hour	—	51.0	Fall River Site #25-005-3001
Ozone (O_3)	1-Hour	0.124	243.1	Truro Site #25-001-0002
Sulfur Dioxide (SO_2)	Annual	0.007	18.3	Fall River Site #25-005-0010
SO_2	24-Hour	0.088	230.6	Swansea Site #25-005-6001
SO_2	3-Hour	0.235	615.7	Swansea Site #25-005-6001

Background ambient air quality concentration information taken from Massachusetts Air Quality Report for 1993. Ambient monitoring data reported in parts per million (ppm) were converted to micrograms per cubic meter ($\mu g/m^3$) based on the following pollutant-specific conversion factors recommended by the MADEP: 1 ppm NO_2 = 1886.8 $\mu g/m^3$, 1 ppm CO = 1146.2 $\mu g/m^3$, 1 ppm SO_2 = 2620.0 $\mu g/m^3$

3.3.2.4 Existing Air Emission Sources

The following section summarizes existing emissions sources at MMR. The activities associated with MAARNG, MAANG, and USCG are the primary emission sources at MMR.

MAARNG. Air pollutant emissions from MAARNG activities area are associated with aircraft operations, military training activities, weapons training, storage tanks, military vehicle maintenance, boiler/water heating systems, and military and POVs. Other emissions sources include annual prescribed burning of portions of the impact area as a fire control measure. The prescribed burning of the impact area has been addressed in previous environmental documentation (MAARNG, 1988b) and is presented in this EIS/EIR as background information only. In addition, excess artillery propellant bag burning activities have not been conducted at MMR since March 1992 and the Adjutant General has stated that this activity will no longer be conducted on MMR. Therefore, this former source will not be included in the baseline conditions.

An emission inventory study was conducted for Camp Edwards to quantify the air pollutant emissions of criteria pollutants and hazardous air pollutants associated with MAARNG activities (MAARNG, 1994a). Actual annual emissions (TPY) for criteria pollutants and volatile organic compounds (VOCs) associated with various MAARNG activities are presented in Table 3-5. The emissions inventory at Camp Edwards included an estimate of actual annual emissions from traditional stationary sources (boilers/water heaters, storage tanks), aircraft operations, and non-traditional sources (brush fires). The Camp Edwards emissions inventory was developed following U.S. Army air emission inventory protocol (U.S. Army Environmental Hygiene Agency, 1992). Based on these guidelines, mobile source emissions were not included in the inventory.

Table 3-5
Actual Annual Air Pollutant Emissions For 1993, Camp Edwards

Source (1)	VOC (TPY)	NO_X (TPY)	CO (TPY)	SO_2 (TPY)	Particulate Matter (2) (TPY)
Boilers/Water Heaters	<0.01	0.26	0.06	1.76	0.03
Generators	0.01	0.07	0.22	<0.01	<0.01
Underground Storage Tanks	<0.01	N/A	N/A	N/A	N/A
Aboveground Storage Tanks	0.01	N/A	N/A	N/A	N/A
Degreasing Operations	0.48	N/A	N/A	N/A	N/A
On-site Gas Stations	0.26	N/A	N/A	N/A	N/A
Tactical Haulers (3)	0.50	N/A	N/A	N/A	N/A
Welding Operations	N/A	N/A	N/A	N/A	<0.01
Miscellaneous Combustion	0.60	1.10	11.10	0.06	0.08
Aircraft Landing/Takeoff	11.3	5.06	7.08	0.85	N/A
Surface Coating Operations	1.52	N/A	N/A	N/A	0.01
Miscellaneous Chemical Use	0.38	N/A	N/A	N/A	N/A
Woodworking Operations	N/A	N/A	N/A	N/A	0.18
Open Detonation	(4)	(4)	(4)	(4)	(4)
Prescribed Burns	N/A	7.63	269.55	N/A	32.72
Wild Fires	N/A	21.16	747.04	N/A	90.68
Firing Ranges Operations	NA	<0.01	2.44	<0.01	0.32
TOTAL - All Sources	**15.06**	**35.28**	**1037.49**	**2.67**	**124.02**
TOTAL - Without Prescribed Burns and Wild Fires	**15.06**	**6.49**	**20.90**	**2.67**	**0.72**

1 Information in this table was obtained from the 1993 Camp Edwards Emissions Inventory (MAARNG, 1994a).
2 Particulate matter emissions consist of matter emitted from sources in solid, liquid, or vapor forms but exists in the ambient air as particulate solids or liquids.
3 Other tactical military vehicles were not included in this analysis.
4 No emission calculations were performed for open detonation activities at Camp Edwards since no emission factors are available.

Notes:

N/A Not Applicable. No significant emissions for this pollutant.
TPY Tons per Year.

Source: MAARNG, 1994a.

The number and type of small arms (less than 25 mm) rounds, and mortar and artillery used in FY 1994 are presented in Tables 3-6 and 3-7, respectively. The emissions inventory conducted for Camp Edwards did not estimate pollutant emissions due to firing ranges activities since no emission factors were available at that time. However, for the purpose of this EIS an emissions analysis (as described in Appendix E) was conducted to estimate the amount of pollutants released due to the firing of small arms and mortar and artillery at Camp Edwards based on combustion analyses provided by the U.S. Army at Picattinny Arsenal (U.S. Army, 1996a). Based on the number and type of small arms rounds and mortar and artillery used in FY 1994, it was estimated that approximately 2.4 TPY of CO, less than 0.01 TPY of nitrogen oxides (NO_x) and SO_2, and 0.3 TPY of particulate matter were released due to the weapons firing activities. The annual air pollutant emissions resulting from weapons firing in FY 1994 were added to the emissions inventory results presented in Table 3-5.

Because the Cape Cod area is prone to brush fires, Camp Edwards forestry management personnel conduct annual controlled burns, with approximately 350 acres of scrub pine, bushes and brush burned in 1993. It has been estimated that an additional 970 acres on Camp Edwards were burned by non-prescribed brush fires (wild fires) in 1993. Without these emissions, the total annual air pollutant emissions for the other MAARNG activities in 1993 were relatively low, ranging from less than one TPY for particulate matter to less than 21 TPY for CO.

Camp Edwards operated 191 boilers/water heaters on natural gas in 1993. Ten additional boilers/water heaters operated with No. 2 fuel oil with the sulfur content equal to or less than 0.5 percent. One boiler was operated with propane. With the predominate use of natural gas at Camp Edwards, the SO_2 emissions from boilers/water heaters were less than two tons for 1993. Since 1993, Camp Edwards has converted all of its heating plants to natural gas and propane, which should further reduce SO_2 emissions.

MAANG. Air pollutant emissions sources at Otis ANGB include aircraft operations, aircraft and engine testing, fuel storage, building heating systems, and military and POVs. Similar to the emissions inventory conducted by MAARNG, MAANG also prepared an emissions inventory in 1993 to quantify emissions associated with Otis ANGB activities (MAANG, 1995a). Annual emissions (TPY) for criteria pollutants and VOCs are presented in Table 3-8. The primary sources of emissions were aircraft operations and testing, and ground-based vehicles (on-highway pool vehicles, off-highway pool vehicles, and personal on-highway vehicle traffic on base).

Table 3-6
FY 1994 Small Arms Firing *

Range	Ammunition Type	Oct. 1993	Nov. 1993	Dec. 1993	Jan. 1994	Feb. 1994	Mar. 1994	Apr. 1994	May 1994	Jun. 1994	Jul. 1994	Aug. 1994	Sept. 1994	Annual Total
A	.50 Cal. MG	5800	2600	0	1600	1600	0	13630	3200	0	0	4000	0	32430
B	Pistol 9 MM	4000	0	0	0	0	0	7426	0	0	0	0	0	11426
	Rifle 5.56	47843	26682	0	0	0	49130	17079	7300	3024	868	0	8840	160766
C	Rifle 5.56	49534	14000	6560	0	0	50314	15800	18770	22283	5560	1546	7140	191507
	Pistol 9 MM	0	0	0	0	0	0	0	0	0	0	0	75	75
	Pistol .45	0	0	0	0	0	0	0	0	0	585	0	0	585
D	M60 MG 7.62 MM	4300	18200	0	0	0	5900	8460	1300	4400	5512	4712	0	52784
E	Pistol 9 MM	5000	0	9600	0	14500	7500	1000	500	1850	3500	1700	1950	47100
	Revolver .38	846	0	0	0	0	0	250	0	535	1200	0	1150	3981
	Pistol .40	0	0	0	0	0	0	0	0	240	0	0	0	240
	Pistol .45	450	1896	400	0	0	740	1281	3200	0	0	0	0	7967
	SG 12 GA	0	0	0	0	0	0	0	0	0	400	0	0	400
F	Not a Live Fire Range													
G	Pistol 9 MM	32450	29070	0	0	0	3200	10950	62200	1500	0	0	47350	180220
	Pistol .380	280	280	0	0	0	0	120	1300	0	0	0	240	2220
	Pistol .38	0	0	0	0	0	0	100	0	150	0	0	0	250
	Pistol .40	0	0	0	0	0	0	0	0	240	0	0	0	240
	Pistol .45	6500	0	0	0	0	0	0	0	0	0	0	0	6500
	Rifle 5.56	6160	1000	140	320	0	0	0	8442	3200	0	0	1016	20278
	M60 MG 7.62 MM	3198	0	0	7700	0	0	0	0	10300	0	0	0	21198
	SG 12 GA	470	100	0	0	0	0	85	750	120	0	0	230	1755
H	Pistol 9 MM	0	1000	0	0	0	0	0	0	1000	0	2500	0	4500
	Pistol .45	3600	0	0	0	0	0	2600	0	0	0	3500	0	9700
	Rifle 5.56	32762	3960	0	2820	0	0	0	0	8500	0	2480	0	50522
	AK47 7.62 MM	0	0	0	0	0	0	0	0	1100	0	0	0	1100
	M60 MG 7.62	0	796	0	0	0	0	0	4600	0	0	0	17740	23336

See notes at end of table

Table 3-6 (Continued)
FY 1994 Small Arms Firing *

Range	Ammunition Type	Oct. 1993	Nov. 1993	Dec. 1993	Jan. 1994	Feb. 1994	Mar. 1994	Apr. 1994	May 1994	Jun. 1994	Jul. 1994	Aug. 1994	Sept. 1994	Annual Total
I	Pistol 9 MM	25700	1200	2600	3000	0	7480	48277	6500	3300	0	0	4200	102257
	Pistol .357	0	700	1800	1100	0	0	0	0	0	0	0	0	3600
	Pistol .38	0	300	0	1100	0	1100	3100	3100	1900	0	0	3000	13600
	Pistol .45	0	0	0	0	0	0	0	0	0	0	0	2750	2750
	Rifle 5.56	20422	1080	0	0	0	11080	4810	1520	160	0	0	1440	40512
	SG 12 GA	800	300	640	340	0	310	2180	610	500	0	0		5680
J	Pistol 9 MM	800	0	300	0	0	0	1100	2450	1650	9100	2500	2000	19900
	Revolver .38	6450	0	0	0	0	2188	17874	0	6100	30	0	450	33092
	Pistol .40	0	0	0	0	0	0	0	0	0	0	0	200	200
	Pistol .45	6400	0	0	0	0	0	0	0	0	0	0	500	6900
	Rifle 5.56	0	0	0	0	0	0	0	2200	1410	0	0	0	3610
	SG 12 GA	995	0	0	0	0	80	970	0	0	1400	250	480	4175
K	Pistol 9 MM	0	0	0	0	2100	0	480	0	3200	0	4100	3500	13380
	Pistol .22	0	0	0	0	3000	2200	0	0	0	2000	0	18	7218
	Revolver .38	0	0	0	0	0	0	0	0	2620	0	0	0	2620
	Revolver .357	0	0	0	0	0	0	930	0	0	0	0	0	930
	Pistol .380	0	0	0	0	0	0	155	0	0	0	0	0	155
	Pistol .40	0	0	0	0	0	0	135	0	0	0	0	0	135
	Pistol .45	0	0	0	0	0	4450	12600	5550	0	2400	0	0	25000
	Rifle 5.56	0	0	0	0	2520	2460	4200	0	0	4180	0	4165	17525
	AR 15 .223	0	0	0	0	0	200	0	0	0	0	0	0	200
	SMG 9 MM	0	0	0	0	0	8000	0	0	800	0	0	0	8800
	SG 12 GA	0	0	0	0	1265	3200	0	0	410	0	0	0	4875
	Rifle 3030	0	0	0	0	0	0	0	0	0	0	300	0	300

See notes at end of table

Table 3-6 (Continued)
FY 1994 Small Arms Firing *

Range	Ammunition Type	Oct. 1993	Nov. 1993	Dec. 1993	Jan. 1994	Feb. 1994	Mar. 1994	Apr. 1994	May 1994	Jun. 1994	Jul. 1994	Aug. 1994	Sept. 1994	Annual Total
KD	Rifle 5.56	28581	3432	450	0	568	7040	32518	7500	18429	3280	5145	9884	116827
	M6 SIG 5.56	1500	0	0	0	0	0	0	0	0	0	0	0	1500
	Rifle .308	0	0	0	0	0	450	0	0	0	0	0	0	450
	Rifle 30-06	0	0	0	0	0	100	0	0	0	0	270	0	370
	Rifle .308	0	0	0	0	0	0	2200	0	0	0	0	0	2200
	Uzi SMG 9 MM	1500	0	0	0	0	0	0	0	800	0	0	0	2300
	M60 7.62 MM	2500	0	0	0	0	0	0	0	0	3080	800	1200	7580
	M118 7.62	80	13	400	0	200	0	4986	0	0	6930	4090	7420	24119
	M31 14.5 MM	0	0	0	0	0	0	0	0	0	260	0	0	260
	TOW	0	0	0	0	0	0	0	0	9	0	0	0	9
L	40 MM (TP)	3543	2027	0	0	0	668	508	517	500	419	249	500	8,931
N	Pistol 9 MM	700	0	0	0	0	0	0	0	0	0	0	0	700
	Pistol .357	150	0	0	0	0	0	0	0	0	0	0	0	150
	Pistol .380	120	0	0	0	0	0	0	0	0	0	0	0	120
	Pistol .45	350	0	0	0	0	0	0	0	0	0	0	0	350
	Rifle 5.56 MM	39110	28136	0	0	0	0	14689	2250	4601	2200	2266	0	93252
O	Pistol 9 MM	13070	2900	0	0	0	4900	1100	4240	6640	0	10350	9400	52600
	Revolver .38	3625	200	0	0	0	1470	300	1050	1335	0	1200	1900	11080
	Pistol .40	0	400	0	0	0	150	0	0	440	0	0	200	1190
	SMG 9 MM	7500	0	0	0	0	0	0	0	1500	0	5350	3000	17350
	SG 12 GA	3155	480	0	0	0	485	2260	505	650	0	2465	1750	11750
	M60 7.62	0	0	0	0	0	0	0	0	0	0	0	600	600

See notes at end of table

Table 3-6 (Continued)
FY 1994 Small Arms Firing *

Range	Ammunition Type	Oct. 1993	Nov. 1993	Dec. 1993	Jan. 1994	Feb. 1994	Mar. 1994	Apr. 1994	May 1994	Jun. 1994	Jul. 1994	Aug. 1994	Sept. 1994	Annual Total
P	Pistol 9 MM	350	0	0	0	0	0	180	0	0	0	0	0	530
	Revolver .357	0	0	0	0	0	0	300	0	0	0	0	0	300
	Revolver .38	650	0	0	0	0	0	0	0	0	0	0	0	650
	Pistol .380	0	0	0	0	0	0	60	0	0	0	0	0	60
	Revolver .40	50	0	0	0	0	0	180	0	0	0	0	0	230
	Pistol .45	3552	9870	0	0	0	0	0	0	1000	0	0	0	14422
	Rifle 5.56	3470	0	0	0	0	1680	0	0	0	0	0	0	5150
	SG 12 GA	0	0	2500	0	0	0	0	0	0	0	0	0	2500
SE	Rifle 9 MM	0	0	0	0	0	0	250	0	0	0	0	0	250
	Rifle 5.56 MM	0	0	0	0	0	0	12500	0	0	0	0	20870	33370
	M60 MG 7.62	10250	6400	0	0	1600	0	6100	15700	13347	10100	12390	11200	87087
SW	M60 MG 7.62	22628	1650	0	0	0	5400	9364	7650	5058	11310	4000	800	67860
	Rifle 5.56	0	0	0	0	0	0	0	0	0	0	10941	0	10941
T	AT4 9 MM	0	0	0	0	0	550	0	0	530	0	0	0	1080
	.50 Cal. PLAS	0	6400	0	0	0	0	0	0	0	0	0	0	6400
U	AT4 9 MM	0	240	0	0	0	712	0	0	0	0	0	200	1152
IBC	Rifle 5.56	2035	0	0	0	0	3500	0	0	10640	3280	8894	12400	40749
	M60 7.62	0	0	0	0	0	0	0	0	1073	0	725	0	1798
	40 MM (TP)	0	0	0	0	0	0	0	0	0	0	647	0	647
	TOTAL	**413,229**	**165,312**	**25,390**	**17,980**	**27,353**	**186,637**	**263,087**	**172,904**	**147,044**	**77,594**	**97,370**	**189,758**	**1,777,358**

Notes:

1. M Range was vacant in FY 1994 so no ammunition fired.
* Denotes the number of individual rounds fired.

Source: Camp Edwards, 1996.

Table 3-7
1994 Mortar and Artillery Fired

Ammunition Type	Oct. 1993	Nov. 1993	Dec. 1993	Jan. 1994	Feb. 1994	Mar. 1994	Apr. 1994	May 1994	Jun. 1994	Jul. 1994	Aug. 1994	Sept. 1994	Totals
60 MM Mortar HE	0	0	0	0	0	0	61	100	0	0	98	0	259
81 MM Mortar HE	0	198	0	0	218	0	280	211	691	100	100	407	2205
81 MM Mortar IL	0	15	0	0	20	0	0	0	0	0	0	0	43
4.2" Mortar HE	0	0	0	0	0	0	98	40	149	0	0	24	311
155 MM HOW LITR	0	0	0	0	0	0	192	171	0	0	0	0	363
Totals	**0**	**213**	**0**	**0**	**238**	**0**	**631**	**522**	**840**	**100**	**198**	**431**	**3,181**

Source: Camp Edwards, 1996.

Table 3-8
Actual Annual Air Pollutant Emissions For 1993, Otis ANGB

Source (1)	VOC (TPY)	NO_2 (TPY)	CO (TPY)	SO_2 (TPY)	Particulate Matter (2) (TPY)
Heating Units - Natural Gas	0.14	3.59	0.78	0.02	0.43
Heating Units - Diesel	<0.01	0.15	0.04	0.57	0.02
Generators -Diesel	0.02	0.19	0.04	0.01	0.01
Generators - Gasoline	<0.01	<0.01	0.05	<0.01	<0.01
Engine Test Cells	0.34	9.16	3.72	0.68	0.16
Fuel Storage Tanks	21.95	N/A	N/A	N/A	N/A
Operational Sources	0.46	N/A	N/A	N/A	N/A
On-highway Pool Vehicles	2.24	4.69	27.64	N/A	0.27
Off-highway Pool Vehicles	2.62	6.96	24.70	0.56	0.78
Employee-Owned Vehicles	2.06	1.37	13.82	—	0.07
Aircraft Landing and Takeoff	9.72	41.65	79.43	5.18	1.34
Aircraft Engine Runups	0.05	0.05	0.38	0.02	<0.01
Aerospace Ground Equipment (AGE)	0.56	3.06	10.49	0.11	0.22
TOTAL - All Stationary Sources	**22.9**	**13.1**	**4.6**	**1.3**	**0.6**
TOTAL - All Mobile Sources	**17.3**	**57.8**	**156.5**	**5.9**	**2.7**
TOTAL - All Sources	**40.2**	**70.9**	**161.1**	**7.2**	**3.3**

(1) Information in this table was obtained from the 1993 Otis ANGB Emissions Inventory (MAANG, 1995a).

(2) Terms commonly associated with the general pollutant "particulate matter" include the following subset of particulate pollutants; total suspended particulates (TSP); PM_{10} ; and primary and secondary particulates.

N/A: Not Applicable. No significant emissions for this pollutant.
TPY - Tons per Year.

Source: MAANG, 1995a.

Since 1990, Otis ANGB has undertaken several activities which have resulted in an overall reduction of pollutant emissions. These activities include a gradual reduction in annual flying hours, removal of the coal-fired boiler as a standby in the central heating plant, replacement of the natural gas-fired central heating plant with individual natural gas space heaters (MAANG, 1995b). Additional activities will be implemented through the year 2000 to further reduce pollutant emissions.

U.S. Coast Guard. The primary emissions sources associated with USCG activities are from mobile sources such as aircraft flight operations (Dassault Falcons and HH-60 helicopters), aircraft refueling and deicing, and on-base vehicle use. The stationary sources at Air Station Cape Cod that emit the greatest quantities of air pollutants include boiler/furnace operation and fuel storage tanks. Annual emissions (TPY) for 1993 are presented in Table 3-9.

Table 3-9
Actual Annual Air Pollutant Emissions For 1993, Cape Cod Coast Guard Air Station

Source	VOC (TPY)	NO_2 (TPY)	CO (TPY)	SO_2 (TPY)	Particulate Matter (1) (TPY)
Boilers - Natural Gas	0.44	6.60	2.41	0.04	0.78
Engines - Diesel	0.10	1.55	0.36	0.15	0.09
Engines - Gas	<0.01	<0.01	0.02	<0.01	<0.01
Fireplaces	0.17	<0.01	0.19	<0.01	0.03
Painting	1.97	N/A	N/A	N/A	N/A
Fuel Storage Tanks	3.63	N/A	N/A	N/A	N/A
Small Arms Firing	N/A	N/A	0.01	N/A	N/A
Misc. Operations	5.32	N/A	N/A	N/A	2.10
Aircraft Operations	10.80	2.92	111.16	1.14	0.06
Aircraft Refueling	3.02	N/A	N/A	N/A	N/A
Aircraft Washing/Deicing	1.98	N/A	N/A	N/A	N/A
Helicopter Operations	0.51	0.80	5.11	0.29	0.58
Engines - Diesel	1.00	12.26	2.64	0.81	0.86
Engines - Gas	1.61	0.46	22.35	0.03	0.04
On-Base Vehicle Mileage	0.92	0.70	17.11	0.02	0.04
TOTAL - All Stationary Sources	**11.63**	**8.15**	**2.99**	**0.19**	**3.00**
TOTAL - All Mobile Sources	**19.84**	**17.14**	**158.37**	**2.29**	**1.58**
TOTAL - All Sources	**31.47**	**25.29**	**161.36**	**2.48**	**4.58**

(1) Terms commonly associated with the general pollutant, "particulate matter" include the following subset of particulate pollutants: total suspended particulates (TSP); PM_{10}; and primary and secondary particulates.

N/A: Not Applicable. No significant emissions for this pollutant.
TPY - Tons per Year.

Source: U.S. Coast Guard, 1994.

USCG has modified their activities in recent years to reduce air pollution emissions. USCG has created a hazardous and toxic material database to calculate air emissions and improve inventory control to reduce the amount of material stored and thus reduce associated emissions. USCG has upgraded the fuel storage and distribution system and selected water-based membranes to replace roofs made of asphalt/tar to reduce VOC emissions throughout the Air Station.

Other MMR Occupants. The remaining occupants at MMR also contribute to overall criteria pollutant emissions. These activities include, but are not limited to, tactical ordnance testing (Textron), skeet shooting (the Otis Fish and Game Club), storage tanks, building heating systems, and associated POVs.

3.3.2.5 Summary

Pollutant emission summaries presented in this study represent actual pollutant emission rates. Tables 3-5, 3-8, and 3-9 summarize the actual annual emissions for criteria pollutants associated with the various MAARNG, MAANG, and USCG activities at MMR in 1993. The air pollutant emissions due to the MAARNG, MAANG, and USCG activities account for the majority of the pollutant emissions at MMR. Based on the amount of baseline emissions presented in this section and Section 4.1, ambient air quality monitoring of criteria pollutant emissions does not appear warranted.

3.3.3 Noise

This section presents a description of the baseline environmental noise conditions associated with activities at MMR. Predominant activities generating noise at MMR include fixed and rotary wing aircraft operations at Otis ANGB, and MAARNG training at Camp Edwards. An overview of noise nomenclature and noise regulations as well as a description of existing noise sources at MMR are provided below. Additional information regarding the measurement and prediction of noise is provided in Appendix F.

3.3.3.1 Overview

Noise is generally defined as unwanted sound. Undesirable effects of environmental (outdoor) noise include interference with sleep, speech communication, and recreational activities. Sound may be described in terms of its amplitude, frequency spectrum (perceived as pitch), and time pattern or duration of individual sound events. Humans can detect sounds over an extremely wide range of amplitude, from the threshold of hearing to the takeoff of a jet aircraft. In terms of sound pressure levels (as measured by a noise meter) this corresponds to ratio of over a million to one. Noise amplitudes are measured on a decibel (dB) scale that effectively compresses this wide range of values and allows use of a two- or three-digit representation for environmental sound pressure levels.

A sound may also be described by its frequency spectrum. Instrumentation exists for the real-time measurement of sound amplitude versus frequency characteristic. Human hearing peaks in the "mid-frequency" range of approximately 1,000 to 2,000 hertz and decreases at the very low and very high frequency ends of the audible spectrum (approximately 30 and 16,000 Hertz). Because of this, and the desire to employ a single number to characterize a given noise environment, various frequency weighting schemes have been developed. In particular, "A" weighting has been found to correlate well with the human perception of the annoyance of various sounds. The USEPA and most other federal agencies including DoD have adopted A-weighting. Sound levels amplitudes, based upon A-weighting, are generally denoted in decibels, A-weighted (dBA). Table 3-10 presents A-weighted sound levels of various sound sources and environments.

Table 3-10
Typical Sound Levels

Outdoor Noise	Noise Level (dBA)	Indoor Noise
	110	Rock Band
Jet Flyover at 1,000 feet		
	100	
		Inside Subway Train (New York)
Gas Lawnmower at 3 feet		
	90	
		Food Blender at 3 feet
Noisy Urban Daytime	80	Garbage Disposal at 3 feet
		Shouting at 3 feet
Diesel Truck at 50 feet		
Gas Lawnmower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area		
		Normal Speech at 3 feet
Heavy Traffic at 300 feet	60	
		Large Business Office
		Dishwasher Next Room
	50	
		Small Theater,
Quiet Urban Nighttime		Large Conference Room (Background)
	40	
Quiet Suburban Nighttime		Library
		Bedroom at Night
	30	
		Concert Hall (Background)
Quiet Rural Nighttime		
	20	
		Broadcast and Recording Studio
	10	
		Threshold of Hearing
	0	

The USEPA, in collaboration with other federal agencies and scientists, has reviewed various methods for describing sound levels outdoors in residential areas and other outdoor areas where people spend time. As a result of that effort, the A-weighted, Day-Night Sound Level (ADNL) was adopted by USEPA (1974), most federal agencies, and the DoD. ADNL represents the A-weighted sound energy averaged over a 24-hour period, with a 10-dB adjustment added to the nighttime (10 p.m. to 7 a.m.) levels. The adjustment is an effort to account for the increased sensitivity to noise during the nighttime. For assessing noise associated with military operations, including those operations presented in this report, additional averaging is applied so the resulting average represents the annual average Day-Night Sound Level. A number of social survey studies have been performed that correlate noise exposure levels (ADNL) and the percentage of respondents who were annoyed by noise. The ADNL and associated social survey data together provide the basis for quantifying human annoyance to general environmental noise, including aircraft noise.

Typical activities that produce noise at MMR include aircraft operations, artillery, mortar, and demolition charges, explosives testing, firing of small arms, and the operation of heavy equipment. These noise sources represent different noise types (impulsive and broadband) and each are described using different noise metrics. Aircraft and heavy equipment operations (broadband) are measured in terms of the ADNL, as described above. For large amplitude impulse noise (demolition charges and explosives testing, and firing of 25 mm or larger size weapons), the C-weighted DNL (CDNL) is used. C-weighting emphasizes the low frequency noise associated with blast activities, and provides a more accurate indication of the public's perception and annoyance with such noise. For small amplitude impulse noise from small arms firing (less than 25 mm), unweighted, peak noise level in decibels (dBP) is used. The dBP provides the best correlation between small arms noise and the percent of population highly annoyed. Each of these noise types and metrics can be converted into a common land use compatibility metric as described below and in Appendix F.

Both Camp Edwards and Otis ANGB have procedures in place to track and follow-up on noise complaints. Complaints regarding weapons firing are managed by Camp Edwards Range Control. Complaints regarding aircraft noise are managed by either Camp Edwards, Otis ANGB Public Affairs, or USCG depending on whose aircraft it is. Details of noise complaints are logged on Noise Complaint questionnaires (Appendix F), and follow-up may include a telephone call or a written response.

3.3.3.2 Noise Criteria

MAARNG, MAANG, and USCG have specific policies regarding the generation of environmental noise. MAARNG has recognized the potential for noise impact on communities adjacent to its installations and has adopted the procedures of the ICUZ Program to perform analyses of MAARNG operations, to work with local communities to encourage appropriate land uses in areas near its facilities, and to seek additional ways to minimize impacts. MAANG has adopted the USAF AICUZ program. The Otis ANGB AICUZ was updated in 1996 to include all flying activities at MMR (MAANG, 1996).

The Federal Interagency Committee on Urban Noise developed land use compatibility guidelines for noise using ADNL. The USAF, U.S. Army, and USCG have adopted these guidelines in their planning programs. Noise levels below 65 dB (ADNL) are considered compatible with residential land use. In ICUZ terminology such a noise environment would correspond to land compatibility Zone I. Areas where the ADNL is between 65 and 75 dBA are considered to be in Zone II, where residential use is normally considered incompatible and would be discouraged. The AICUZ study recommends that communities adopt noise attenuation requirements in their building codes for residences within the 65 to 75 dBA contour. Those areas with ADNL greater than 75 dBA are in Zone III, which is considered incompatible for residential use by the USAF, U.S. Army, and USCG. For the impulsive noise environments previously characterized by CDNL and dBP noise metrics, a conversion to the three land compatibility zones is accomplished through common degrees of public annoyance, as described in Appendix F.

3.3.3.3 Existing Noise Levels

As described above, activities at MMR generate various types of noise. Specific activities that produce noise are described below. Figure 3-1 depicts the composite baseline noise zone contours for activities conducted at MMR in 1994. Figures 3-2 and 3-3 present baseline contours for activities conducted independently by Camp Edwards and Otis ANGB, respectively.

Camp Edwards. Primary MAARNG noise sources include large- and small-arms firing, and helicopter (UH-1) and fixed-wing (C-26) aircraft operations. Other sources include noise associated with heavy equipment and tracked vehicle operations, diesel truck convoys, and POVs.

Large amplitude impulse noise is produced by armor, artillery, and demolition activities and is described in terms of CDNL (see Figure 3-2). In addition, small amplitude impulse noise resulting from small-arms (less than 25 mm) firing, is produced by machine guns, rifles, pistols, and shotguns. The number and type of small arms rounds, and mortar and artillery use in FY 1994 are presented in Tables 3-6 and 3-7, respectively. The existing range configuration is shown on Figure 3-4.

As stated above, because of the difference in noise types, different methods are used to analyze noise. A noise simulation software program called MicroBNOISE was used to develop noise contours for activities conducted in 1994 involving munitions greater than 25 mm. For munitions smaller than 25 mm, weapon type, direction of fire, and range location are used to compute the dBP. These resulting noise levels are then combined with social survey data that relates the percentage of the population that is highly annoyed by such noise exposure. This figure shows that Zone III areas, except for north of Snake Pond and east of Greenway Road, are contained within MMR boundaries. With the exception of areas in the vicinity of Snake and Peter's Pond, Zone II areas are also contained within MMR boundaries. For more information regarding these methodologies, see Appendix F.

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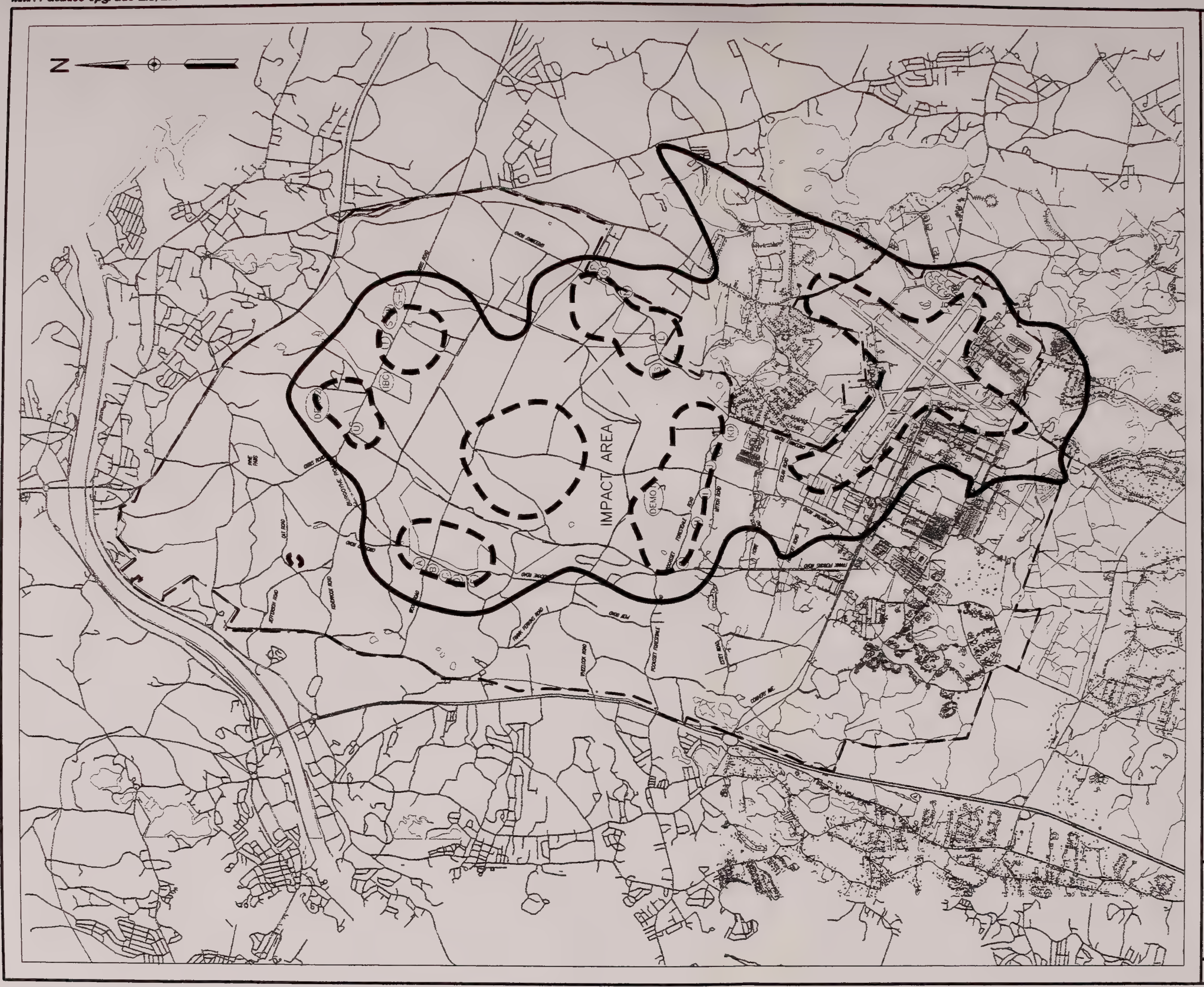
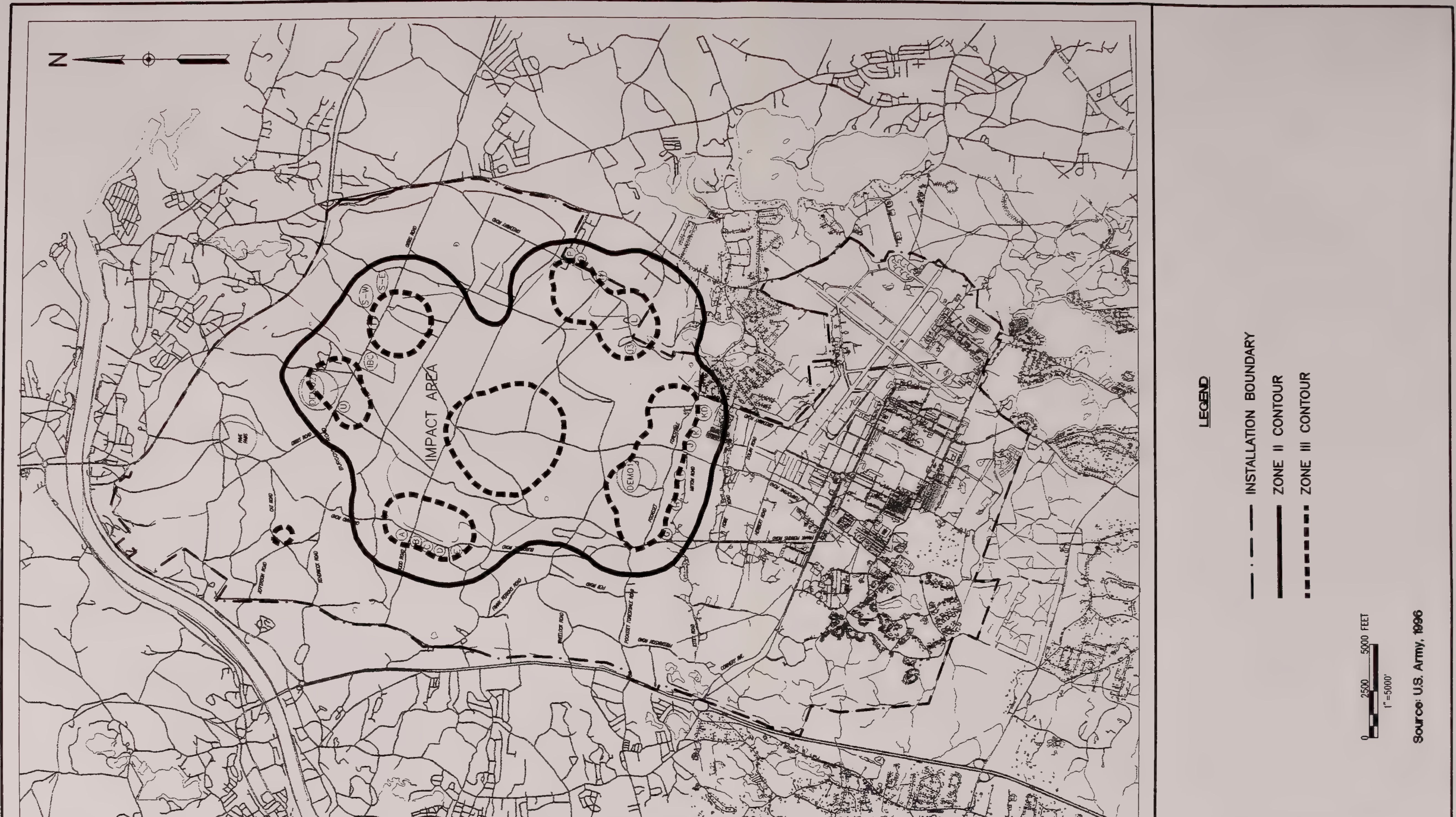

N
IMPACT AREA
DEMO
LEGEND
INSTALLATION BOUNDARY
NORMALLY INCOMPATIBLE WITH RESIDENTIAL USE
INCOMPATIBLE WITH RESIDENTIAL USE
0
2500
5000 FEET
1"=5000'

Source: U.S. Army, 1996; MAANG, 1996

EXISTING COMBINED NOISE CONTOURS (FY 1994)

File Name: J:\6650-14\6650F041.DWG

Figure 3-1

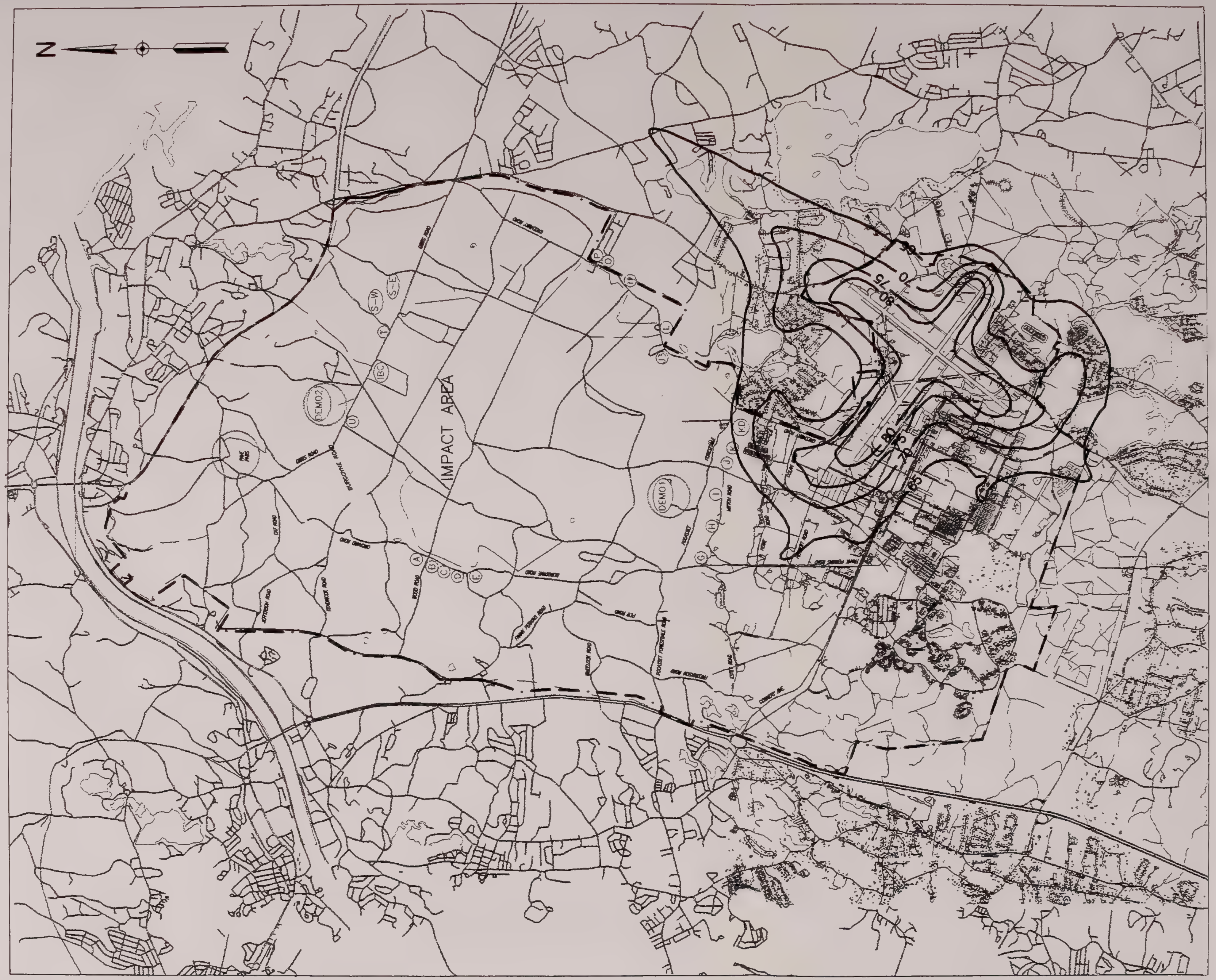


Source: U.S. Army, 1996

EXISTING CAMP EDWARDS NOISE CONTOURS (FY 1994)

File Name: J:\6650-14\6650F046.DWG

Figure 3-2



LEGEND

— · — INSTALLATION BOUNDARY

——— NOISE CONTOURS (65 – 80 db)

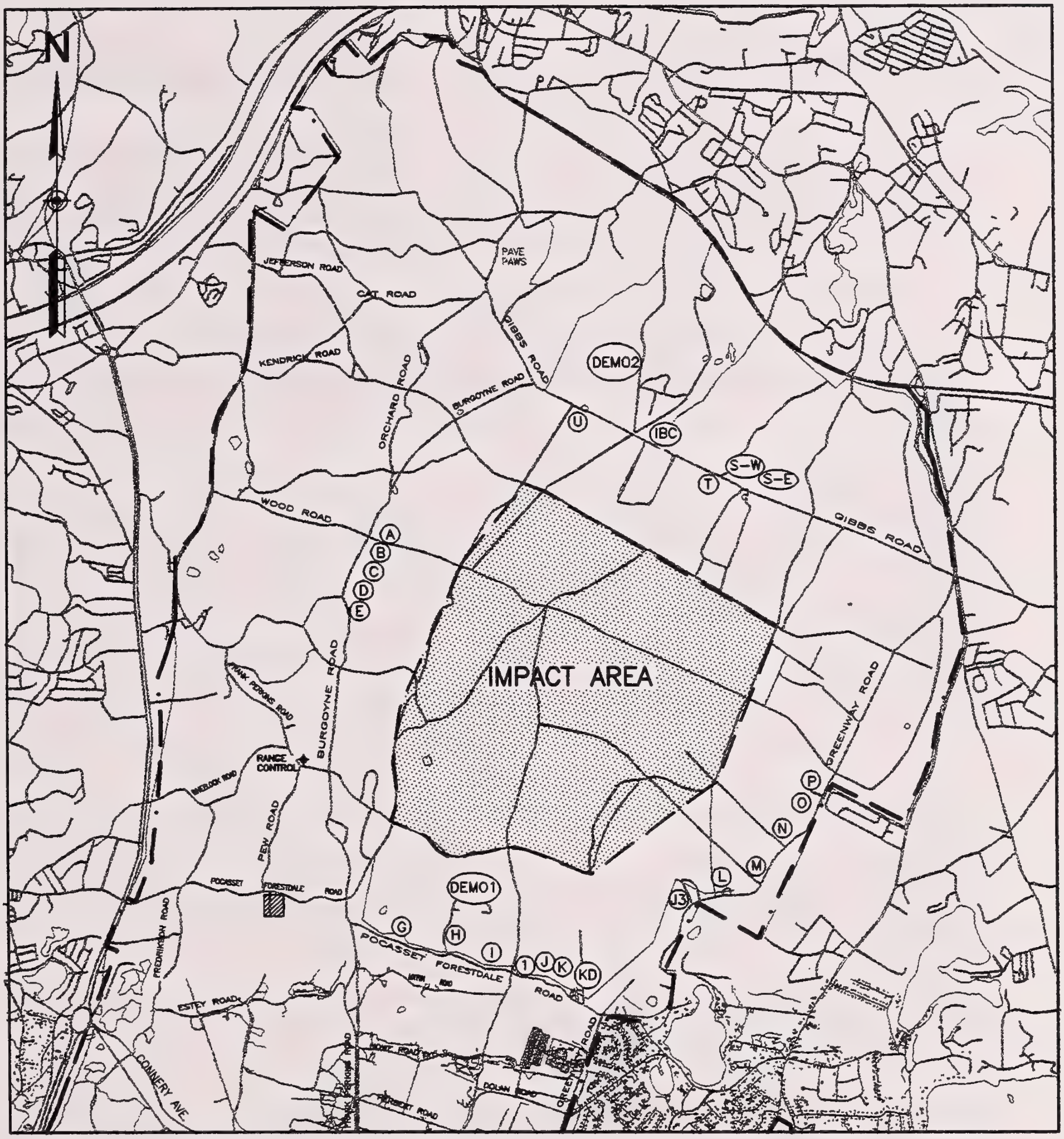
0 2500 5000 FEET
1"=5000'

Source: MAANG, 1996

EXISTING OTIS ANGB NOISE CONTOURS (FY 1994)

File Name: J:\6650-14\6650F046.DWG

Figure 3-3



LEGEND

— · — — INSTALLATION BOUNDARY

— — — IMPACT AREA BOUNDARY

Ⓐ EXISTING RANGE

▨ EXISTING AMMUNITION SUPPLY POINT (ASP)

0 2500 5000 FEET

1"=5000'

Source: Massachusetts Military Reservation

EXISTING RANGE AND MANEUVERING AREA AT MMR

File Name: J:\6650-14\6650F036.DWG

Figure 3-4

Broadband noise resulting from MAARNG aircraft (Table 3-11) was analyzed using NOISEMAP (see Appendix F). This methodology considers the effect of an aircraft single event (source noise, altitudes, and airspeed), how many times such events occur during a 24-hour period, and the time of day they occur (NGB, 1987).

Table 3-11
Total Average Daily Flight Operations at MMR

Operation	Arrivals/Departures	Closed Patterns
C-26	0.50	N/A
F-15A	12.42	11.12
T-42 (Beech King Air)	0.40	3.00
Civilian INM54 Lear Jet	0.15	N/A
USCG Falcon Jet	5.49	10.60
USCG Helicopter	8.52	5.00
MAARNG Helicopter	32.98	29.06
Other Transient Aircraft	1.74	N/A

N/A = Not applicable
Source: MAANG, 1996

Otis Air National Guard Base. Primary MAANG noise sources include aircraft (F-15) flight operations, and aircraft and engine testing (see Table 3-11). Other noise sources include aerospace ground equipment and military and private vehicles.

U.S. Coast Guard. Noise sources associated with USCG activities are similar to those activities described for Otis ANGB above. Primary noise sources include fixed and rotary wing aircraft operations (see Table 3-11). Other sources include vehicular traffic.

Textron. The primary noise-producing activity conducted by Textron is the explosive testing of tactical ordnance items. Textron typically detonates a maximum of two ordnance items per week.

Otis Fish and Game Club. Skeet shooting at the Otis Fish and Game Club produce small amplitude impulse noise.

Other Activities. The remaining occupants on MMR: USAF; USDA; VA; USMC; and FAA conduct activities, such as weapons firing, sporting events, and seminars. These noise generating activities are included in the analysis.

3.3.4 Earth Resources

This section presents the regional (western Cape) and local (MMR) physical setting with respect to landform and geology, topography, and soils.

3.3.4.1 Landform and Geology

The landform and geology of Cape Cod is the result of the last phase of continental glaciation and subsequent rise in sea level that occurred approximately 15,000 years ago. The retreating continental ice sheet deposited from 100 to more than 1,000 ft of gravel, sand, silt, and clay on top of bedrock (LeBlanc, 1984). Ridges of poorly sorted boulders, sand, gravel, silt and clay called moraines were formed where the glacier remained in one place for a relatively long period of time. Two moraines, the Buzzards Bay Moraine and the Sandwich Moraine were formed on the Cape. Portions of the Buzzards Bay Moraine overlie the western boundary of MMR, and the Sandwich Moraine overlies the northern boundary.

As the glacier melted, streams carried sand and gravel and deposited them in front of the moraines, forming an outwash plain of a highly irregular and unorganized kame and kettle terrain. A kame is a hill of rock debris that originally filled a hole in the glacier and was left behind when the ice retreated. A kettle is a depression in the glacial debris originally filled by a piece of ice. As the buried ice melted, the surrounding deposits collapsed to form kettle holes or pits. This area on the Cape is called the Mashpee pitted outwash plain. Much of MMR property lies within the central portion of the Mashpee pitted outwash plain. The outwash plain slopes southward across MMR toward Nantucket Sound.

Glacial deposits at MMR range in thickness from approximately 175 ft in the NW (near the Cape Cod Canal) to approximately 325 ft along the Buzzards Bay Moraine, then decrease to approximately 250 ft near Nantucket Sound in the south. The Buzzards Bay and Sandwich moraines include up to 100 ft of poorly-sorted glacial moraine sediments overlying well-sorted sand and gravel outwash sediments. Boring logs from monitoring wells in the moraines indicate that sediments range in size from silt to boulders (E.C. Jordan, 1989). The Mashpee pitted outwash plain sediments consist of coarse to medium sand overlying fine to very fine sand and silt (E.C. Jordan, 1987). A thin layer of wind-blown sand and silt, deposited prior to vegetation, caps the glacial deposits. Beneath the outwash plain borings have encountered fine grained lacustrine (glacial lake) deposits. These fine silt and sand deposits overlie the bedrock.

3.3.4.2 Topography

Elevations within MMR range from approximately 250 ft above mean sea level (msl) to the north in the Sandwich Moraine to about 50 ft above msl at the southern site boundary. The highest point on the reservation is Pine Hill, which is near the southwest corner of the Impact Area and has an elevation of approximately 270 ft above msl.

Rapid elevation changes of 60 to 100 ft are common along the moraines. In contrast, the topography of the Mashpee pitted outwash plain is generally less variable, with steep changes in surface elevations confined to areas where kettle holes and ponds are located. Additionally, the southern area of the outwash plain, beyond the MMR boundary, is marked by a series of long erosional valleys which provide channels for rivers such as the Quashnet and Coonamessett rivers.

3.3.4.3 Soils

The general soil associations at MMR are the Plymouth-Canton-Carver soil association found to the north and west, and the Agawam and Enfield soil series to the south and east (Soil Conservation Service, 1980). As a result of glacial activities, these soils are primarily sand and gravel mixed with silt and clay. The Plymouth-Canton-Carver soil association is a very well-drained soil that developed in a fine sandy loam mantle over glacial till. These soils have a stony surface and are highly permeable. The Mashpee pitted outwash plain is dominated by the Agawam and Enfield series. The Agawam soils are well-drained and consist of a sandy loam surface soil and subsoil. Typically, they are free of gravel to a depth of 3 ft. The Enfield series are also highly permeable and are characterized by a 2-foot deep layer of crumbly silt loam surface soil and subsoil. In general, the nutrient quality of the soil is low. Although with proper management, the soils are considered good for forest land, pasture, or wildlife habitat (Soil Conservation Service, 1980).

Generally, soils in the training area of MMR have been undisturbed except for around roadways, bivouac areas, ranges, the gravel pit, the quarry and the impact area. Soils in the cantonment area of MMR have been largely disturbed by construction activities.

3.3.4.4 Soil Studies

The U.S. Army has conducted studies regarding the effects of weapons training activities on soils and groundwater. One study conducted in 1993 determined the effects on the impact area located at Aberdeen Proving Ground (APG), Maryland (U.S. Army Environmental Hygiene Agency, 1993). The soil type, composition, pH, rainfall amount, and local hydrogeologic conditions at APG are similar to those found on MMR. A comparison of soil and groundwater conditions found at APG and MMR is provided in Table 3-12. The impact area at APG includes six ranges covering more than 28,000 acres. Intensive weapons testing and training have been conducted since World War II on these active ranges, where a large diversity of munitions have been used including bombs, mines, grenades, rockets, as well as small and large caliber weapons.

Based on the impact area soil and groundwater similarities between APG and Camp Edwards, the impact area at APG can be considered a reasonable and conservative estimate of baseline conditions at the Camp Edwards impact area both operationally and environmentally in terms of the potential for explosives in soils.

Table 3-12
Comparison of Aberdeen Proving Ground and Camp Edwards Impact Area Soils and Groundwater

APG	Camp Edwards
60 - 70% Silt Loam	Silty to Sandy Loam
10 - 25% Sand	Course Grain Sand
<10% Clay	<6% Clay
4.0 - 5.5 pH	4.5 - 6.0 pH
Depth to Groundwater: 5 - 20 feet	Depth to Groundwater: 45 - 60 feet
Surface Streams	No Surface Streams
Source: U.S. Army Environmental Hygiene Agency, 1993 and U.S. Army Corps of Engineers, 1996b	

Explosives or degradation products were not found in 16 surface or subsurface soil samples taken in the impact area at APG, or in the sediments of two creeks which traverse it (U.S. Army Environmental Hygiene Agency, 1993). This is not unexpected considering the nature of explosives and propellants when fired from weaponry. When munitions are employed, the propellant and/or explosives are generally consumed, leaving behind metal parts and other inert components that may be distributed in small pieces across a larger area. If residual explosives remain after detonation, the explosives are subject to latent energy and autodegradation which will either consume the residual or transform it into non-detectable constituents (USACOE, 1995). Explosives are more likely to be found in soils where munitions, propellants, or explosives were manufactured or disposed of, thus creating a point source. Considering the low intensity of munitions containing explosives and propellants employed at Camp Edwards (both historically and currently) in comparison to similar activities taking place at APG, explosives or their degradation products are not expected to be found above detectable levels in soils within the Camp Edwards impact area.

The U.S. Army recently conducted studies at Camp Edwards range facilities to determine the potential vertical migration of metals through the soils into the groundwater. Metals such as antimony, copper, iron and lead can accumulate in soil berms surrounding the small fire arms ranges, and may migrate vertically and horizontally via infiltration of rain water. These studies involved the collection of surface and subsurface soil samples immediately south of the impact area at Ranges G, H and K, along Pocasset Road and Forestdale Road. These ranges were selected for study because of the wide variety of small arms fired, large volume of rounds fired in FY 1994, and the resulting concentration of projectiles in the soil berms downrange of the targets.

A total of eight soil samples were collected for metals analysis. Six soil samples were collected from 0 to 60 inches and two samples from depths of 10 ft and 56 ft below land surface (bls). Collection of deeper soil samples were restricted due to adverse drilling conditions (e.g., large rocks). Concentrations of metals were detected in both the surface and subsurface soils, with the highest concentrations in soils from 0 to 2 ft bls. Metals migrated approximately 5 to 6 ft bls. MAARNG will evaluate potential treatment technologies to address metals detected in surface and subsurface soils at existing small arms firing ranges.

3.3.5 Water Resources

Groundwater is the primary water resource within MMR. There are no large ponds or streams within MMR; however, surface conditions are important because the numerous small depressions located within MMR are a major source of groundwater recharge. Regional and local surface water and groundwater resources are discussed in the following paragraphs.

3.3.5.1 Surface Water

The major salt water bodies of the upper Cape Cod area include Cape Cod Bay (north of MMR), Nantucket Sound (south of MMR), and Buzzard's Bay (west of MMR). The Cape Cod Canal connects Cape Cod Bay with Buzzard's Bay and is located north of MMR. Because of rapid infiltration of rainfall into the sandy subsurface materials, no major rivers or streams developed within MMR boundaries. Intermittent streams fed by surface water runoff discharging from storm drainage systems are present on MMR during moderate or heavy rainfall events. The Coonamessett River and the Childs River are located south of MMR and flow south from Coonamessett and Johns Pond, respectively. These two rivers discharge to Nantucket Sound.

Although several large freshwater ponds exist in the Upper Cape area, none of these ponds are located within the MMR boundary. Ashumet, Coonamessett, and Johns Ponds (south of MMR), and Wakeby, Mashpee, Snake, and Peters Ponds (east of MMR) are the major surface water bodies near MMR and range in size from approximately 100 to 1,000 acres. Most of these surface water bodies are recharged by groundwater. Several smaller ponds, typically less than 10 acres, are located within the MMR boundary near the Otis Fish and Game Club, and near the housing complex in the southwestern portion of MMR.

3.3.5.2 Groundwater

As described in Section 3.3.4.1, unconsolidated glacial outwash sediments and glacial moraines dominate the geology of western Cape Cod. These glacially derived materials consist mainly of sands and gravels and form an important water supply source for Cape Cod. A single groundwater flow system, known as the Cape Cod aquifer, underlies western Cape Cod from the Cape Cod Canal to the villages of Barnstable and Hyannis. The Cape Cod aquifer has been designated a sole-source aquifer by the USEPA, and MMR is wholly located within the boundaries of this aquifer, specifically the Sagamore Lens. The aquifer is recharged by the infiltration of rainfall.

The total thickness of the aquifer varies from approximately 80 ft in the south to about 350 ft in the north. The variation in aquifer thickness is the result of episodes of glacial advance and retreat, the underlying bedrock geology, and the presence of significant fine-grained materials in the deeper sediments beneath the southern portion of the aquifer. The groundwater table varies from a high of 60 ft msl in the impact area to a low of 45 ft msl along the southern MMR boundary.

The Cape Cod aquifer is unconfined (i.e., in equilibrium with atmospheric pressure) and is recharged by infiltration from precipitation. The high point of the water table, or the top of the groundwater mound within the western Cape Cod groundwater system, is located beneath the northern portion of MMR. Flow is generally radially outward from this mound. Groundwater flows north to either the Cape Cod Canal or Cape Cod Bay, east toward Bass River in the central part of the Cape, south and SE to Cape Cod's southern shore (Nantucket Sound), and west and southwest to Buzzards Bay. The developed portions of MMR lie on the southern and southwestern flanks of the groundwater mound. In the southern part of MMR, groundwater flows from the north beneath the cantonment area and airfield and then off MMR to the south or west.

Since November 1985, Well "J", located north of the flight line on Herbert Road, has been the major water supply well serving the MMR community. Well "J" is equipped with a fixed-rate pump that delivers between 1,450 and 1,500 gallons per minute. Typical daily pumping volumes are 400,000 to 500,000 gallons, extracted over a 4.5- to 5.5-hour period.

Because MMR overlies Cape Cod aquifer, there is concern regarding the effects past activities in the impact area have had on the aquifer. As discussed in Section 3.3.4.4, explosives (as a result of small arms or mortar and artillery use) are not expected to be found above detectable levels in soils within the impact area. Because concentrated point sources of explosives do not result from weapons firing, it is also unlikely that explosives or degradates resulting from small arms or mortar and artillery use will be found above detectable levels in groundwater beneath the impact area at Camp Edwards. Studies at APG indicate the High Melting Explosive (HMX) and Royal Dutch Explosive (RDX) were found above detectable levels in two of 15 groundwater samples taken in the APG impact area. However, this contamination has been attributed to former industrial activities in the area (U.S. Army Environmental Hygiene Agency, 1993). Groundwater samples taken in the impact area at Camp Edwards as part of the IRP (site CS-19) have detected RDX; however, similar to APG, this contamination is likely from former disposal activities rather than from weapons firing. This contamination is being addressed under the IRP. Monitoring well samples taken as part of a Long Range Water Supply Study, including eight wells located adjacent to and surrounding the MMR boundary downgradient from the impact area, did not detect explosives in any of the samples (Stone and Webster, 1995).

All groundwater samples collected from the APG impact area (1993) and analyzed for metals were below federal and Maryland drinking water standards (U.S. Army Environmental Hygiene Agency, 1993). As stated in Section 3.3.4.4, vertical migration of metals at Camp Edwards is relatively slow (2 to 3 inches per year) and is not expected to occur except for areas with concentrated sources such as the berms and their immediate vicinity. Analyses of soil samples taken in front of the berms at Camp Edwards confirmed that metals from firing range activities have not migrated below six feet bls. Sampling and analysis of groundwater from monitoring wells in the vicinity of this impact area (Long Range Water Supply Study) resulted in the detection of lead in one well above the federal and state reportable concentration. This detection of 0.017 milligrams per liter (mg/L) slightly exceeded the reportable concentration of 0.015 mg/L. This well is located NW of the MMR boundary and east of Route 28. All other monitoring wells were non-detect for lead.

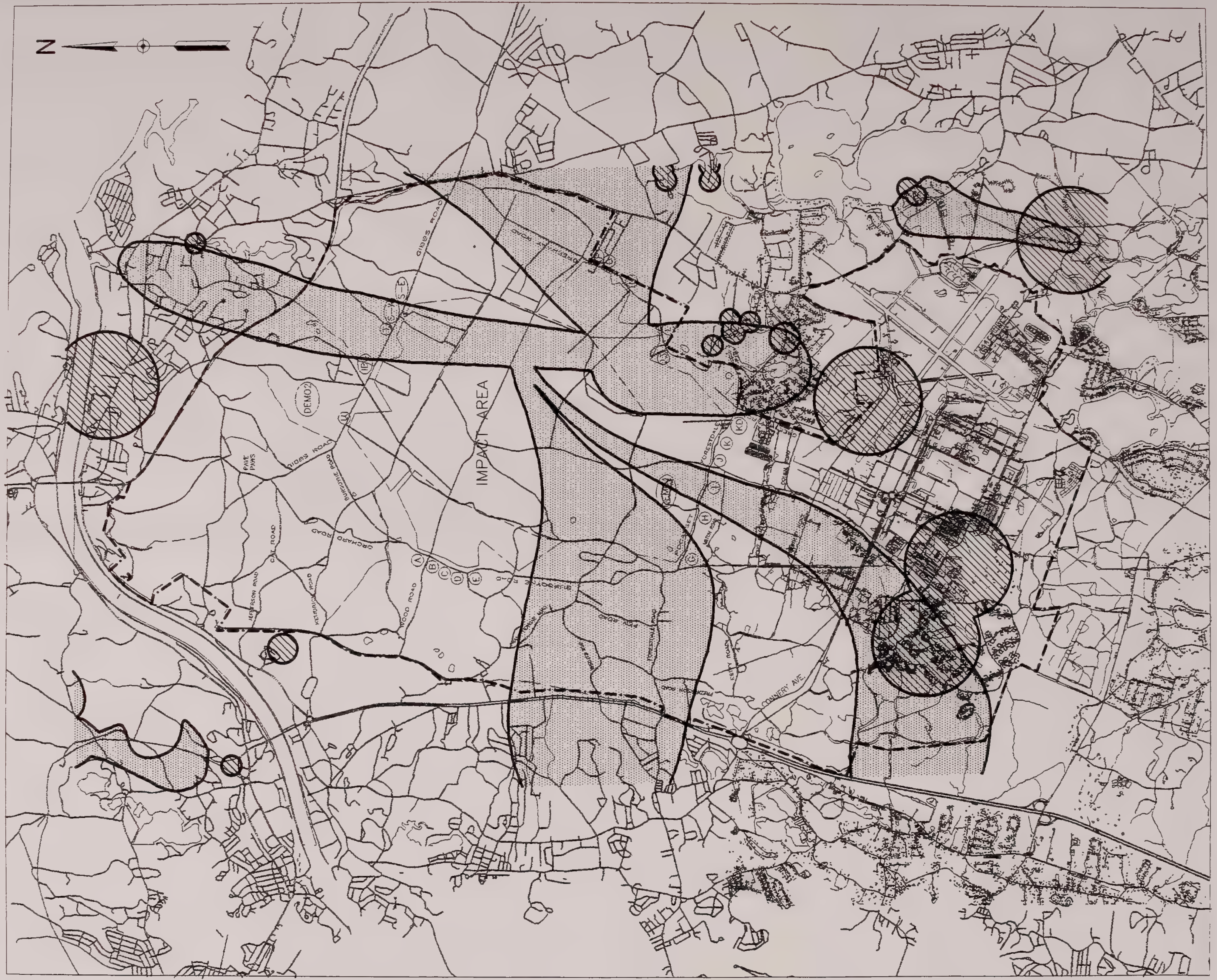
3.3.5.3 Water Quality

Under natural conditions, the groundwater on Cape Cod is of good quality for drinking and other uses. The water is typically low in dissolved solids. Constituents believed to be potential threats to drinking water supplies include salt from seawater intrusion, coastal flooding, highway deicing, nitrogen from municipal sewage, and naturally occurring iron and manganese.

The "J" Well located on Otis ANGB, supplies water for MMR. The Mashpee Water District provides MMR a back-up water source. Well J is monitored in accordance with 310 CMR 22.00. Sample results consistently demonstrate that Well J provides safe drinking water.

3.3.5.4 Wellhead Protection

A "wellhead protection area" is a term used by the federal government to describe the area overlying an aquifer that directly supplies a public water supply well. In Massachusetts, the terms "zone of contribution" and "Zone II area" are synonymous with wellhead protection area. The zone of contribution, or Zone II as defined in 310 CMR 24.00, is that area of an aquifer that contributes water to a well under the most severe recharge and pumping conditions that can be realistically anticipated. Zone II boundaries are not permanently fixed, but vary in size and shape, depending on hydrogeological conditions and pumping stress. Zone II areas in and around MMR are provided in Figure 3-5.



LEGEND

— - — INSTALLATION BOUNDARY

░ ZONE II

▨ INTERIM WELLHEAD PROTECTION AREA

NOTE:
ZONE II AREAS HAVE BEEN APPROXIMATED.
SOME ZONE II AND INTERIM WELLHEAD PROTECTION EXTREME BOUNDARIES HAVE NOT BEEN COMPLETELY DEFINED.

0 2500 5000 FEET
1"=5000'

Source:
Camp Edwards Environmental Protection Office

ZONE II AND INTERIM WELLHEAD PROTECTION AREAS ON AND NEAR MMR

File Name: J:\6650-14\6650F037.DWG

Figure 3-5

3.3.5.5 Water Resource Districts

Water resource districts have been established in each of the four neighboring towns. A water resource district is an overlay zoning designation within which stricter development regulations apply in order to protect the public water supply. Uses that could possibly introduce toxic or hazardous materials are prohibited within these districts. Such uses include fuel or chemical storage, landfills, dry cleaning, sewage treatment, road salt stockpiles, car washes, metal plating, chemical and bacteriological laboratories, and boat and motor vehicle repair. In addition, any use which includes retention of less than 40 percent of the lot area in its natural state or creates impervious surfaces covering more than 20 percent of the lot area are prohibited. The bylaws also stipulate performance standards for allowable uses. These standards primarily address fertilizer application, sewage flow, hazardous materials storage, waste disposal, and impervious surface runoff. Enforcement of the water resource district regulations is administered by each town's Board of Health. Several water resource districts stretch across MMR and through the neighboring towns. MMR, being state property, is not regulated by the municipal zoning regulations, but is required to conform with the Massachusetts CWA.

Sandwich. In Sandwich, a water resource district covers much of the eastern portion of MMR, beginning at a well field near the canal, continuing under Route 6, and extending the length of the installation to another well field near Snake Pond south of the airfield. Two arms of this district extend to the NE and east, serving a well field east of the Shawme-Crowell State Forest and multiple well fields near Spectacle and Lawrence Ponds.

Bourne. There are three water resource districts in Bourne that have implications for MMR. North of MMR, the South Sagamore Water Resource District extends from the Cape Cod Canal to Route 6. Along the MMR western boundary, the Bourne Water Resource District - A North extends from the railroad spur in Pocasset to an area in MMR that includes the Otis Fish and Game Club and military training grounds. Also along the western boundary, but south of the MMR main gate rotary, the Bourne Water Resource District - A South extends from the railroad spur to an area of MMR that includes military housing and the VA Cemetery.

Mashpee. There are two water resource districts adjacent to MMR in Mashpee. One extends from the MMR boundary through Ashumet Pond to the SE. The other extends from the MMR boundary due east toward Barnstable.

Town of Falmouth. In Falmouth, a Water Resource Protection District extends from the MMR boundary, southwest across Route 151, encompassing Coonamessett Pond, Deep Pond and Crooked Pond. This district intersects the eastern corner of the small part of MMR that extends into Falmouth. Another district extends further to the southwest encompassing Swallow Pond, Round Pond, Jenkins Pond, Deer Pond, Mares Pond and Long Pond. Along Falmouth's eastern border with Mashpee, a third district runs adjacent to the town border from Ashumet Pond south to Fresh Pond.

3.4 Biological Environment

This section summarizes the existing biological environment at MMR and provides an overview of the types of ecological communities present at the installation. Information presented in this section has been based largely on biological surveys completed by the Camp Edwards Environmental Protection Office. Table 3-13 presents a summary of completed, ongoing, or future scheduled biological surveys at MMR.

MMR covers approximately 21,000 acres, much of it undeveloped. This area, combined with the 742-acre Shawme-Crowell State Forest to the north and the 1,721-acre Crane Wildlife Management Area to the south, provides one of the largest contiguous areas of wildlife habitat on the Upper Cape. Very few surface water bodies are within the MMR boundary. Small ponds and wetlands (less than 10 acres in size) comprise less than 0.5 percent of the total area of MMR. No perennial flowing water bodies (i.e., streams or rivers) are within the MMR boundary.

Table 3-13
Biological Surveys and Studies Conducted on the
Camp Edwards Training Site, MMR

Survey or Study	1992	1993	1994	1995	1996[1]
Floristic Survey[2]	✓	✓	✓		
Rare Plants				✓	✓
LCTA[3] - Vegetation			✓	✓	✓
LCTA[3] - Mammals		✓	✓	✓	✓
LCTA[3] - Birds			✓	✓	✓
Secretive Waterbirds				✓	
Grassland Birds				✓	✓
Whip-Poor-Wills					✓
Amphibians				✓	✓
Turtles				✓	✓
Odonates				✓	✓
Impacts of Bivouac Site Development on Scrubland Birds[4]				✓	
Survey and Management of T & E Lepidoptera[5]					✓

[1] Studies for 1996 are ongoing.
[2] Conducted under contract by the Massachusetts Natural Heritage and Endangered Species Program.
[3] Conducted as part of the Camp Edwards Land Condition Trend Analysis (LCTA; Tazik et. al., 1992) program.
[4] Conducted under contract by the University of Massachusetts, Department of Forestry and Wildlife Conservation.
[5] Conducted under contract by the Lloyd Center for Environmental Studies.

Vegetative communities, aquatic habitats, fish and wildlife, and rare, threatened, and endangered species existing at MMR are discussed below.

3.4.1 Vegetation

This section describes the upland and wetland plant communities, as well as the existing vegetation management practices, that characterize MMR. The general vegetative cover types at MMR are illustrated in Figure 3-6.

3.4.1.1 Upland Plant Communities

The majority of terrestrial habitat at MMR consists of upland vegetative communities that may be broadly categorized as either upland forest, upland shrub, or upland open areas. Prior to 1935, the area suffered an extensive forest fire that altered the ecosystem and resulted in a dense growth of scrub oak, pitch pine, and briar. Figure 3-6 depicts general vegetative cover types based on existing maps (James M. Montgomery, 1991) that have been updated from 1993 aerial photographs. Each of these communities is discussed below. Table 3-14 summarizes the vegetative cover types in acreage and as a percentage of the total acreage at MMR.

Table 3-14
Summary of Vegetation Types on MMR

Vegetation Type	Acres	Percent of Total
Forest	12,610	60
Shrub	2,760	13
Grass/Open	3,763	18
Developed	1,708	8
Wetlands	74	1
Total Acreage:	**20,915**	**100**

Forests. Forests comprise approximately 12,600 acres, or approximately 60 percent of the total acreage at MMR. This category includes dry oak-pine woods (Jenkins, 1995b). Most of the forested community of MMR may be referred to as sandplain oak-pine woodland, also known as pitch pine/scrub oak barrens. This habitat is found throughout the Cape and other sandy or gravelly areas in southern New England. The predominant vegetation includes pitch pine and scrub oak. Other species of pine occurring at MMR include scotch pine (*Pinus sylvestris*) and white pine (*Pinus strobus*). Oaks other than scrub oak include black oak (*Quercus velutina*), white oak (*Quercus alba*), dwarf chestnut oak (*Quercus prinoides*) and scarlet oak (*Quercus coccinea*). Prevalent understory vegetation over much of the area includes low bush blueberry (*Vaccinium angustifolia*),

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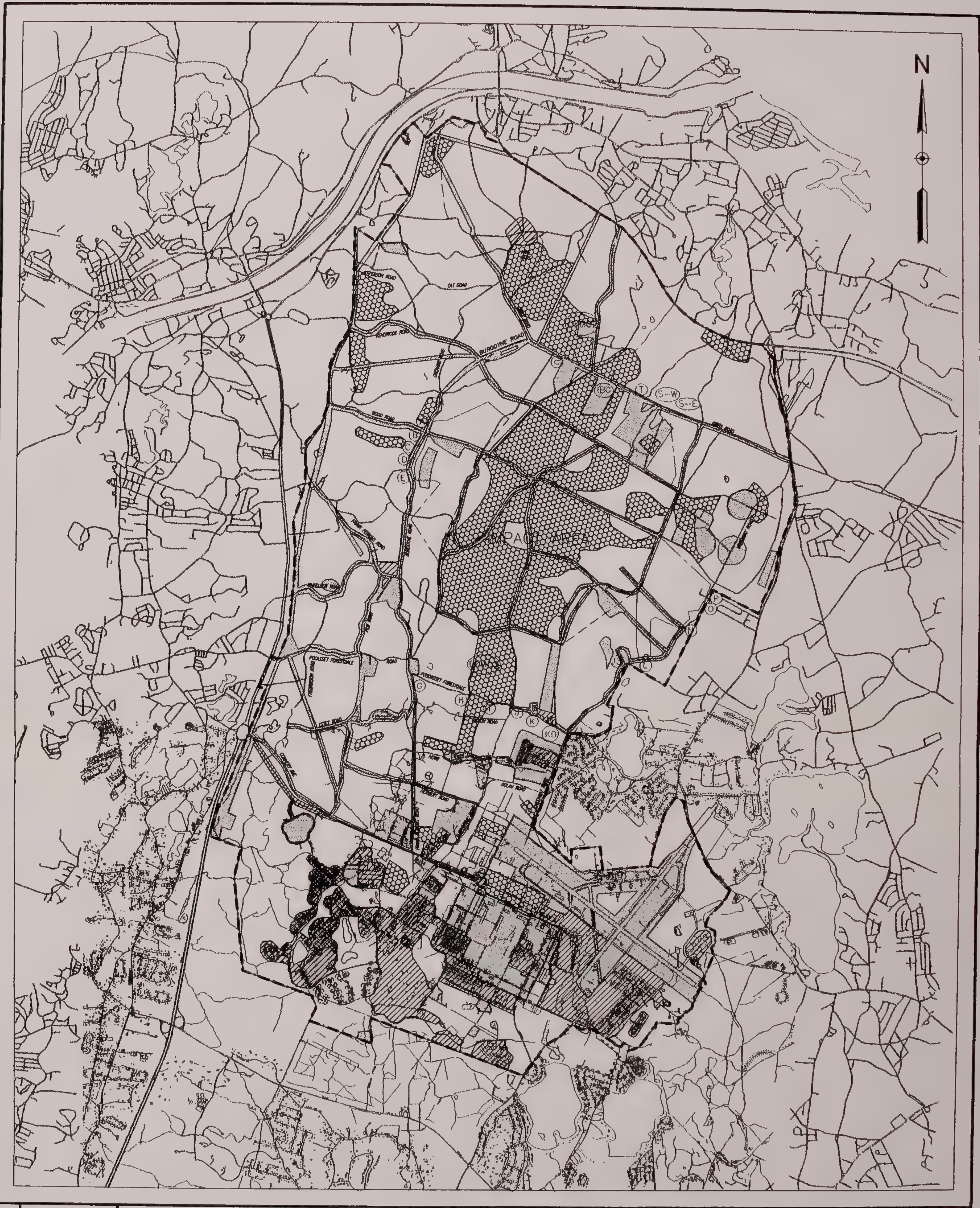

NOTE:

NOT TO SCALE. HABITATS ARE ESTIMATED BASED ON A REVIEW OF HISTORICAL HABITAT COVER (MacCONNELL 1971) AND MADEP AERIAL PHOTOGRAPHS TAKEN IN MAY, 1993.

0 2500 5000 FEET
1"=5000'

Source: CAMP EDWARDS ENVIRONMENTAL PROTECTION OFFICE

LEGEND

☐ CONIFEROUS, DECIDUOUS, OR MIXED FOREST ARE REPRESENTED BY NON-HATCHED AREAS.

▩ CONIFEROUS, DECIDUOUS, OR MIXED SHRUB. INCLUDES SOME AREAS THAT ARE PRIMARILY SHRUB BUT MAY ALSO HAVE SOME ROADS OR BUILDINGS.

▒ GRASSY AREAS/DIRT ROADS. INCLUDES SOME AREAS THAT ARE PRIMARILY GRASSY BUT MAY ALSO HAVE SOME ROADS AND BUILDINGS.

▨ DEVELOPED AREAS (BUILDINGS PAVEMENT, GOLF COURSE). INCLUDES SOME AREAS THAT ARE PRIMARILY DEVELOPED BUT MAY ALSO HAVE AREAS OF GRASS OR TREES.

—·—·—·— INSTALLATION BOUNDARY

VEGETATION/COVER TYPE AT MMR

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Figure 3-6

black huckleberry (*Gaylussacia baccata*), sheep laurel (*Kalmia angustifolia*), sweet fern (*Myrica pensylvanica*) and white catbrier (*Smilax glauca*). Herbaceous layer species include bracken fern (*Pteridium aquilinum*), wintergreen (*Gaultheria procumbens*), asters (*Aster* sp.) and goldenrod (*Solidago* sp. and *Euthamia* sp.).

Shrub. Shrub upland areas comprise nearly 2,800 acres, or roughly 13 percent, of the total acreage at MMR. The shrub upland areas are generally considered to be transitional areas, although they may persist for decades. The majority of the shrub areas at MMR have been affected either by human activities at the base (i.e., range activities in the Impact Area, other forest management practices) or by wildfires. The vegetation in these areas rarely exceeds 10 to 15 ft in height, and the ground cover is typically sparse. Dominant vegetation within the shrub upland areas consists primarily of extremely dense, often impenetrable stands of young pitch pine and scrub oak mixed with huckleberry, greenbriar, sheep laurel, blueberry, sweet fern, wintergreen and bracken fern.

Open Areas. Open, grassland communities comprise nearly 3,800 acres, or approximately 18 percent, of the acreage at MMR. These open areas have developed as a result of various activities at MMR and are associated primarily with the cantonment area and the runways at Otis ANGB as well as maneuvering ranges used for training activities. Herbaceous species within these open areas include a variety of grasses, mosses, and common weedy species, including little bluestem (*Andropogon scoparius*), Pennsylvania sedge (*Carex pennsylvanicum*), goldenrod, reindeer moss (*Cladonia* sp.) and hawkweeds (*Hieracium* spp.).

3.4.1.2 Wetland Plant Communities

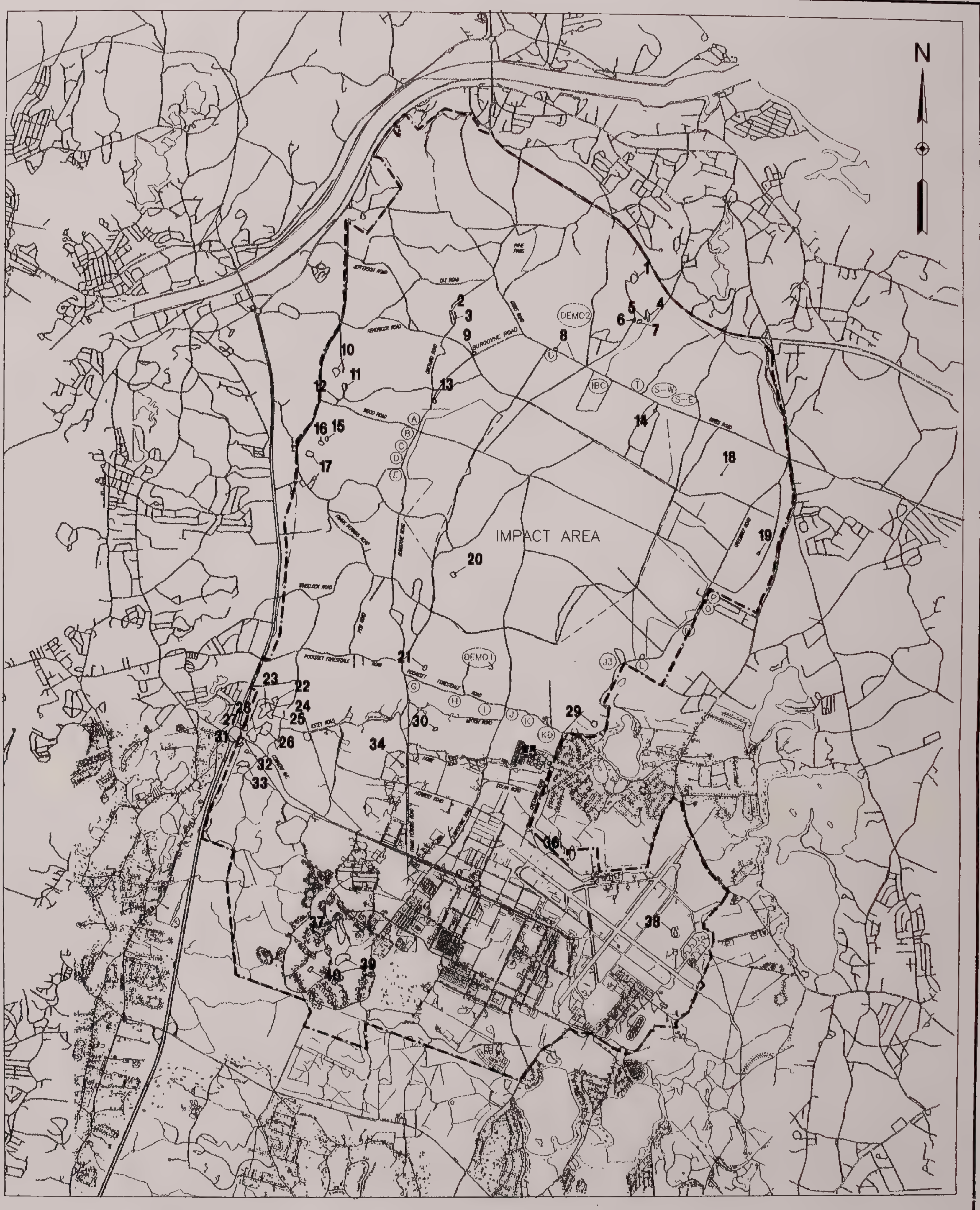
Wetlands are considered to be important natural resources and are protected under both federal and state laws. In addition to federal and state regulations, wetlands are also protected by Army Regulations (AR200-3, Natural Resources-Land, Forest, and Wildlife Management). Wetlands are defined under Section 404 of the federal CWA as: "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas" (40 CFR 230).

The Massachusetts Wetlands Protection Act (MGL c.131, s.40) identifies several "Areas Subject to Protection Under the Act". Areas at MMR in this category include bordering vegetated wetlands (wetlands that border ponds or other water bodies), banks, land under water, and isolated land subject to flooding. Bordering vegetated wetlands are areas where the soils are saturated and/or inundated such that they support a predominance of wetland indicator plants. Isolated land subject to flooding is a depression or closed basin without an inlet or an outlet that serves as a ponding area for surface water runoff or high groundwater that has risen above the ground surface. It is also defined as an area which at least once a year confines standing water to a volume of at least 1/4 acre-foot, and to an average depth of at least 6 inches. The state definition of wetlands does not include vernal pools; however, certified vernal pools are afforded protection if they are located within an Area Subject to Protection Under the Act. Vernal pools are discussed in Section 3.4.4.3, Habitats of Special Concern.

Wetlands at MMR were initially identified based on maps created from satellite imagery that were presented in the Environmental Management Analysis Program for the Massachusetts Military Reservation (James M. Montgomery Consulting Engineers, Inc., 1991). The occurrence and locations of the wetlands initially identified in the EMAP were refined based on 1993 aerial photographs, and then confirmed in the field by Camp Edwards and MADEP personnel in 1995. These wetlands have not yet been delineated; delineation and further characterization of all of the wetlands at Camp Edwards has been scheduled for 1997. Any wetlands potentially affected by proposed project locations will be delineated in accordance with the Massachusetts Wetlands Protection Act (MWPA) and CWA. The Areas Subject to Protection under the MWPA are inclusive of areas that would be defined by the USACE as wetlands under Section 404 of the CWA. Therefore, delineation and protection of wetlands in accordance with MADEP regulations will include federal wetland resources as well. Coordination with the appropriate town conservation commissions, as well as with the USACE, in accordance with MWPA and CWA, will be initiated, and requirements of both the USACE and MADEP/conservation commissions will be incorporated into the project design.

There are very few wetland areas present within the MMR boundary (Figure 3-7). Vegetated wetlands and surface water bodies combined comprise approximately 74 acres, or less than 0.5 percent of the total acreage at MMR. Other areas located within topographical depressions may possess wetland characteristics but would not qualify as jurisdictional wetlands, bordering vegetated wetlands, or isolated land subject to flooding according to applicable federal and state regulations (Massachusetts Wetlands Protection Act).

Types of wetlands present on MMR are summarized in Table 3-15. All of the wetlands identified on MMR are classified as palustrine, which is defined by Cowardin et al (1979) as including all non-tidal wetlands dominated by trees, shrubs, persistent emergent, emergents mosses or lichens, and all such wetlands that occur in tidal areas where salinity due to ocean derived salts is less than 0.5 parts per thousand. The palustrine wetlands at MMR are further classified into one of five classes: 1) forested, 2) scrub-shrub, 3) emergent, 4) unconsolidated bottom, and 5) aquatic bed (Camp Edwards, 1996). Each of these classes is discussed below.



NWI CLASSIFICATION

PSS – PALUSTRINE SCRUB SHRUB
PFO – PALUSTRINE FORESTED
PEM – PALUSTRIINE EMERGENT
PUB – PALUSTRINE UNCONSOLIDATED BOTTOM

PAB – PALUSTRINE AQUATIC BED

—·—·— INSTALLATION BOUNDARY

0 2500 5000 FEET
1"=5000'

Source: CAMP EDWARDS ENVIRONMENTAL PROTECTION OFFICE

WETLANDS KEY

NO.	NAME	NWI CLASSIFICATION	NO.	NAME	NWI CLASSIFICATION
1	SPRUCE SWAMP	PSS1	21	OPENING POND	PUB2
2	MONUMENT SWAMP CISTERN	PUB4	22	FISH & GAME BOG	PSS1
3	MONUMENT SWAMP	PSS1	23	FISH & GAME NORTH	PEM1
4	RACCOON SWAMP E	PEM1	24	FISH & GAME RED MAPLE	PFO1
5	RACCOON SWAMP D	PUB4	25	FISH & GAME MEADOW	PEM1
6	RACCOON SWAMP A	PUB4	26	FISH & GAME EAST	PSS1
7	RACCOON SWAMP B	PEM1	27	FISH & GAME WEST	PEM1
8	GIBBS POND	PEM2	28	FISH & GAME SOUTH	PEM1
9	ROUND SWAMP	PSS1	29	BYPASS BOG	PSS1
10	CRANBERRY BOG	PSS1	30	GP-3 POND	PEM1
11	DEEP BOTTOM POND	PAB3	31	ROTARY SOUTH	PEM1
12	RED MAPLE SWAMP	PFO1	32	CONNERY SOUTH	PEM1
13	BAILEY'S POND	PEM1	33	TRAILER POND	PEM2
14	GRASSY POND	PEM1	34	A2 POND	PEM1
15	LITTLE HALFWAY POND	PEM2	35	UTES POND	PEM1
16	TANK TRAIL POND	PEM1	36	NORTH OF AIRFIELD	PFO1
17	DONNELY POND	PUB4	37	OSBORNE POND	PUB2
18	OX POND *	PEM	38	AIRFIELD BOG	PSS1
19	CG TOWER POND	PSS1	39	EDMUNDS POND	PUB2
20	SUCCONSETTE POND	PUB	40	SPIT POND	PUB2

* POND IS PRESENT ON MAPS, BUT CANNOT BE LOCATED ON GROUND.

WETLANDS AND WETLAND-LIKE HABITATS AT MMR

File Name: J:\6650-14\WETLANDS.DWG

Figure 3-7

Table 3-15
Summary of Wetland Types at MMR

Wetland Type	Acres	Percent of Total
Palustrine		
forested	5.4	7
scrub/shrub	18.7	25
emergent	29.3	40
unconsolidated bottom	19.3	26
aquatic bed/other	1.3	2
Total Acreage:	**74.0**	**100**

Palustrine Forested. Palustrine forested wetlands are characterized by woody vegetation that is at least 6 m (20 ft) tall. There are only four palustrine forested wetlands on MMR, totaling less that 6 acres or only 7 percent of the total wetland area at MMR (see Figure 3-7).

Palustrine Scrub-Shrub. Palustrine scrub-shrub wetlands are characterized by woody vegetation that is less than 6 m (20 ft) tall. Species in a scrub-shrub wetland include true shrubs, young trees, and trees or shrubs that are small and stunted due to various limiting factors in the environment. There are several palustrine scrub-shrub wetlands scattered across MMR, comprising approximately 19 acres or 25 percent of the total wetland acreage (see Figure 3-7).

Palustrine Emergent. Palustrine emergent wetlands are characterized by erect, rooted, herbaceous plants adapted to wet conditions. Palustrine emergent wetlands are the most common wetlands on MMR, totaling approximately 30 acres or 40 percent of the total wetland acreage (see Figure 3-7).

Palustrine Unconsolidated Bottom. Palustrine unconsolidated bottom wetlands include all wetland and deep water habitats with at least 25 percent cover of particles smaller than stones, and a vegetative cover less than 30 percent. These wetlands, which include the larger named ponds (e.g., Osborne and Edmunds Pond), comprise approximately 20 acres or 26 percent of the total wetland acreage at MMR (see Figure 3-7).

Palustrine Aquatic Bed. Palustrine aquatic bed wetlands include wetlands and deep water habitats dominated by plants that grow principally on or below the surface of the water. Deep Bottom Pond, the only wetland of this type at MMR, is slightly more than 1 acre in size, comprising roughly 2 percent of the total wetland acreage (see Figure 3-7).

3.4.1.3 Vegetation Management

Historically, the softwood forest ecosystems on the Cape were maintained by wildfires that controlled species composition and age structure (James M. Montgomery, 1991). Pitch pine is the dominant softwood occurring on MMR. This species is extremely resistant to fire, and it thrives on the sandy, well-drained acidic soils found on the Cape. Prescribed burns are planned annually within the impact area to reduce the build-up of understory vegetation which, if allowed to accumulate, could fuel larger, more destructive wildfires. As a result of weather conditions and other factors, these burns do not occur every year. Prescribed burns are considered a vital wildfire prevention measure needed to reduce the risks from and severity of any wildfires that may result from mortar and artillery fire, as well as those resulting from natural causes (MAARNG, 1988a).

Commonwealth Electric and MAARNG are responsible for powerline and right-of-way maintenance, respectively. These cleared corridors provide additional edge habitat (i.e., bordered on one side by forest and on the other by field/open areas) used by many birds and mammals for foraging and nesting.

3.4.2 Aquatic Habitats

Aquatic habitats present on MMR are limited to a number of small ponds scattered throughout the installation. These ponds include Edmunds and Osbourne Pond at the southern end of the installation, two unnamed ponds located within property currently leased to the Otis Fish and Game Club, Opening Pond located south of the Impact Area, Deep Bottom Pond located west of the Impact Area, Grassy Pond located north of the Impact Area, Succonsette Pond located within the Impact Area, and Donnely Pond located along the western border of the installation.

Larger water bodies are located just beyond the MMR boundary, Peters, Snake, Weeks, Wakeby, and Mashpee Ponds are to the east of MMR, with Ashumet, Johns, and Moody Ponds to the south. Numerous harbors associated with Buzzards Bay are located approximately one mile west of the MMR boundary. Cape Cod Canal lies to the north, and Cape Cod Bay is NE of MMR.

Because of the highly permeable soils and glacial materials, rivers and streams are absent from MMR and are rare on the Inner Cape. The four rivers nearest MMR are 1) the Coonamessett River which flows south from Coonamessett Pond, 2) the Childs River which flows from Johns Pond, 3) Pocasset and 4) the Black Rivers which lie to the west. Intermittent streams present on MMR are situated within a few drainage swales which typically flow or contain ponded water during and immediately after moderate or heavy rainfall events.

3.4.3 Fish and Wildlife

The largely undeveloped land within MMR provides a significant amount of contiguous habitat for wildlife. MMR is a potentially important wildlife corridor that connects additional large tracts of habitat in the Shawme-Crowell State Forest to the north and the Crane Wildlife Management Area to the south. A wide variety of wildlife species forage within the roadsides, rights-of-way, forest openings, cleared areas, and open fields of this corridor. The forested areas provide refuge and cover for some species, and nesting and foraging sites for others.

3.4.3.1 Mammals

A variety of mammals occur at MMR (Table 3-16). These mammals include red fox, gray fox, raccoon, striped skunk, eastern cottontail rabbit and white-tailed deer (White and Melvin, 1985). Small mammals at MMR include white-footed mouse, southern redbacked vole, short-tailed shrew, masked shrew, meadow vole, eastern chipmunk and southern flying squirrel.

3.4.3.2 Birds

The dense growth of pitch pine and scrub oak provides cover and nesting areas for many bird species, such as ruffed grouse, wild turkey, black-capped chickadee, pine warbler, American goldfinch, mourning dove, bluejay, northern mockingbird, rufous-sided towhee, common yellowthroat, brown thrasher, American robin, red-tailed hawk and great horned owl.

Northern bobwhite quail forage along forest edges and in fields and other open areas. The open areas also provide foraging opportunities for predatory species such as American kestrel and northern harrier, as well as for grassland species such as the upland sandpiper, grasshopper sparrow and vesper sparrow. Over 100 species of migratory birds use the Cape Cod area as a major stopover along the Atlantic Flyway (MAARNG, 1985b). Numerous bird species have been observed on MMR during the breeding season; these are listed in Table 3-17.

3.4.3.3 Amphibians/Reptiles

Terrestrial or semi-aquatic amphibians observed at MMR include American toad, spotted salamander, and red-backed salamander. Terrestrial reptiles at MMR include the eastern box turtle and black racer.

Table 3-16
Mammals That Occur, or are Likely to Occur, on MMR [1]

Common Name	Scientific Name
Short-tailed shrew *	*Blarina brevicauda*
Masked shrew *	*Sorex cinereus*
Star-nosed mole	*Condylura cristata*
Hairytail mole	*Parascalops breweri*
Eastern mole	*Scalopus aquaticus*
Big brown bat *	*Eptesicus fuscus*
Silver-haired bat	*Lasionycteris noctivagans*
Red bat	*Lasiurus borealis*
Hoary bat	*Lasiurus cinereus*
Keen's *Myotis*	*Myotis keenii*
Small-footed *Myotis* [2,3]	*Myotis leibii*
Little brown *Myotis*	*Myotis lucifugus*
Eastern pipistrelle	*Pipistrellus subflavus*
Southern redbacked vole *	*Clethrionomys gapperi*
Meadow vole *	*Microtus pennsylvanicus*
Pine vole	*Microtus pinetorum*
Muskrat *	*Ondatra zibethicus*
White-footed mouse *	*Peromyscus leucopus*
Southern bog lemming [2]	*Synaptomys cooperi*
House mouse	*Mus musculus*
Norway rat [4]	*Rattus norvegicus*
Black rat [4]	*Rattus rattus*
Southern flying squirrel [5] *	*Glaucomys volans*
Woodchuck *	*Marmota monax*
Gray squirrel *	*Sciurus carolinensis*
Eastern chipmunk *	*Tamias striatus*
Red squirrel *	*Tamiasciurus hudsonicus*
Meadow jumping mouse	*Zapus hudsonius*
Opossum *	*Didelphis marsupialis*
Snowshoe hare	*Lepus americanus*
Eastern cottontail *	*Sylvilagus floridanus*
New England cottontail [3]	*Sylvilagus transitionalis*
Striped skunk *	*Mephitis mephitus*
Short-tailed weasel *	*Mustela ermina*
See notes at end of table	

Table 3-16 (Continued)
Mammals That Occur, or are Likely to Occur[1], on MMR

Common Name	Scientific Name
Long-tailed weasel	*Mustela frenata*
Mink *	*Mustela vison*
Raccoon *	*Procyon lotor*
Domestic cat *	*Felis cattus*
Domestic dog *	*Canis familiaris*
Coyote *	*Canis latrans*
Gray fox *	*Urocyon cinereoargenteus*
Red fox *	*Vulpes vulpes*
White-tailed deer *	*Odocoileus virginianus*

[1] List is based on the distribution of these mammals as indicated in *Peterson Field Guides, Mammals* by W. H. Burt and R. P. Grossenheider, *New England Wildlife* by R. A. DeGraaf and D. D. Rudis, and *Wild Mammals of New England* by A. J. Godin.

[2] Massachusetts Status - Special Concern

[3] Federal Status - Candidate

[4] One rat, of undetermined species, was observed on Camp Edwards in 1995. DeGraaf and Rudis indicate that only Norway rats occur on Cape Cod, but verification of specimen was not possible before release.

[5] USDA - UMASS gypsy moth project has two questionable records of northern flying squirrels (*Glaucomys sabrinus*) occurring in the area of Deer Horn Hill. None of the references indicated in note 1 indicate that this species occurs in eastern Massachusetts or Cape Cod.

* Species confirmed at Camp Edwards.

Source: Camp Edwards, 1996.

Table 3-17
Birds That Occur on MMR During the Breeding Season

Common Name	Scientific Name
Common Loon [1]	*Gavia immer*
Double-crested Cormorant	*Phalacrocorax auritus*
Great Blue Heron	*Ardea herodias*
Great Egret	*Casmerodius albus*
Green-backed Heron	*Butorides striatus*
Mute Swan	*Cygnus olor*
Canada Goose	*Branta canadensis*
Wood Duck	*Aix sponsa*
Mallard	*Anas platyrhynchos*
Red-breasted Merganser	*Mergus serrator*
Turkey Vulture	*Cathartes aura*
Osprey	*Pandion haliaetus*
Northern Harrier [2]	*Circus cyaneus*
Sharp-shinned Hawk [1]	*Accipiter striatus*
Cooper's Hawk [1]	*Accipiter cooperii*
Broad-winged Hawk	*Buteo platypterus*
Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*
Ring-necked Pheasant	*Phasianus colchicus*
Ruffed Grouse	*Bonasa umbellus*
Wild Turkey	*Meleagris gallopavo*
Northern Bobwhite	*Colinus virginianus*
Killdeer	*Charadrius vociferus*
Spotted Sandpiper	*Actitis macularia*
Upland Sandpiper [3]	*Bartramia longicauda*
American Woodcock	*Scolopax minor*
Herring Gull	*Larus argentatus*
Great Black-backed Gull	*Larus marinus*
Common Tern [1]	*Sterna hirundo*
Rock Dove	*Columba livia*
Mourning Dove	*Zenaida macroura*
Black-billed Cuckoo	*Coccyzus erythropthalmus*
Great Horned Owl	*Bubo virginianus*
Whip-poor-will	*Caprimulgus vociferus*
Chimney Swift	*Chaetura pelagica*
Ruby-throated Hummingbird	*Archilochus colubris*
See notes at end of table	

Table 3-17 (Continued)
Birds That Occur on MMR

Common Name	Scientific Name
Belted Kingfisher	*Ceryle alcyon*
Downy Woodpecker	*Picoides pubescens*
Hairy Woodpecker	*Picoides villosus*
Northern Flicker	*Colaptes auratus*
Eastern Wood-Pewee	*Contopus virens*
Eastern Phoebe	*Sayornis phoebe*
Great Crested Flycatcher	*Myiarchus crinitus*
Eastern Kingbird	*Tyrannus tyrranus*
Horned Lark	*Eremophila alpestris*
Tree Swallow	*Tachycineta bicolor*
Northern Rough-winged Swallow	*Stelgidopteryx serripennis*
Barn Swallow	*Hirundo rustica*
Blue Jay	*Cyanocitta cristata*
American Crow	*Corvus brachyrhynchos*
Fish Crow	*Corvus ossifragus*
Black-capped Chickadee	*Parus atricapillus*
Tufted Titmouse	*Parus bicolor*
White-breasted Nuthatch	*Sitta carolinensis*
House Wren	*Troglodytes aedon*
Eastern Bluebird	*Sialis sialis*
Hermit Thrush	*Catharus guttatus*
Wood Thrush	*Hylocichla mustelina*
American Robin	*Turdus migratorius*
Gray Catbird	*Dumetella carolinensis*
Northern Mockingbird	*Mimus polyglottos*
Brown Thrasher	*Toxostoma rufum*
Cedar Waxwing	*Bombycilla cedrorum*
European Starling	*Sturnus vulgaris*
Chestnut-sided Warbler	*Dendroica pensylvanica*
Pine Warbler	*Dendroica pinus*
Prairie Warbler	*Dendroica discolor*
Black and White Warbler	*Mniotilta varia*
American Redstart	*Setophaga ruticilla*
Ovenbird	*Seiurus aurocapillus*
Northern Waterthrush	*Seiurus noveboracensis*
Common Yellowthroat	*Geothlypis trichas*
See notes at end of table	

Table 3-17 (Continued)
Birds That Occur on MMR

Common Name	Scientific Name
Scarlet Tanager	*Piranga olivacea*
Northern Cardinal	*Cardinalis cardinalis*
Rufous-sided Towhee	*Pipilo erythrophthalmus*
Chipping Sparrow	*Spizella passerina*
Field Sparrow	*Spizella pusilla*
Vesper Sparrow [2]	*Poecetes gramineus*
Savannah Sparrow	*Passerculus sandwichensis*
Grasshopper Sparrow [2]	*Ammodramus savannarum*
Song Sparrow	*Melospiza melodia*
Swamp Sparrow	*Melospiza georgiana*
Red-winged Blackbird	*Agelaius phoeniceus*
Eastern Meadowlark	*Sturnella magna*
Common Grackle	*Quiscalus quiscula*
Orchard Oriole	*Icterus spurius*
Brown-headed Cowbird	*Molothrus ater*
Baltimore Oriole	*Icterus galbula*
Purple Finch	*Carpodacus purpureus*
House Finch	*Carpodacus mexicanus*
American Goldfinch	*Carduelis tristis*
House Sparrow	*Passer domesticus*

Notes:

[1] Massachusetts Status - Special Concern
[2] Massachusetts Status - Threatened
[3] Massachusetts Status - Endangered

Source: Camp Edwards, 1996.

The ponds and swamps located within MMR may support various amphibians and reptiles that depend upon an aquatic or semi-aquatic habitat to fulfill portions of their life history requirements. Frogs such as the green frog, bullfrog, and wood frog, as well as various salamanders and turtles including snapping turtles, musk turtle, and spotted turtles may use the ponds and swamps located within MMR. Snakes such as the eastern ribbon snake and northern water snake may also utilize these habitats.

Amphibians and reptiles known to occur at MMR are listed in Table 3-18.

Table 3-18
Amphibians and Reptiles That Occur, or are Likely to Occur, on MMR [1]

Common Name	Scientific Name
AMPHIBIANS	
Eastern spadefoot [2]	*Scaphiopus holbrookii*
American toad *	*Bufo americanus*
Fowler's toad *	*Bufo woodhousii fowleri*
Gray treefrog *	*Hyla versicolor*
Spring peeper *	*Pseudacris crucifer*
Wood frog *	*Rana sylvatica*
Bullfrog *	*Rana catesbeiana*
Green frog *	*Rana clamitans*
Northern leopard frog	*Rana pipiens*
Pickerel frog	*Rana palustris*
Spotted salamander *	*Ambystoma maculatum*
Red-backed salamander *	*Plethodon cinereus*
Four-toed salamander [3]*	*Hemidactylium scutatum*
Eastern newt *	*Notopthalmus viridescens viridescens*
REPTILES	
Snapping turtle *	*Chelydra serpentina*
Musk turtle *	*Sternotherus odoratus*
Eastern painted turtle *	*Chrysemys picta picta*
Eastern box turtle [3]*	*Terrapene carolina*
Spotted turtle [3]	*Clemmys guttata*
Black racer *	*Coluber constrictor constrictor*
Smooth green snake *	*Opheodrys vernalis*
Milk snake *	*Lampropeltis triangulum triangulum*
Ringneck snake *	*Diadophis punctatus edwardsii*
Eastern hognose snake [4]	*Heterodon platyrhinos*
Ribbon snake *	*Thamnophis sauritus sauritus*
Garter snake *	*Thamnophis sirtalis sirtalis*
Northern water snake	*Nerodia sipedon sipedon*
Red-bellied snake	*Storeria occipitomaculata*
Northern brown snake	*Storeria dekayi dekayi*

[1] List of amphibians is based on the distribution of these amphibians as indicated in A Guide to Field Identification, Amphibians of North America by H. Smith, New England Wildlife by R. A. DeGraaf and D. D. Rudis, and This Broken Archipelago by J. D. Lazell, Jr. List of reptiles is based on the distribution of these reptiles as indicated in A Guide to Field Identification, Reptiles of North America by H. Smith and E. D. Brodie, Jr., New England Wildlife by R. A. DeGraaf and D. D. Rudis., and This Broken Archipelago by J. D. Lazell, Jr.

[2] Massachusetts Status - Threatened

[3] Massachusetts Status - Special Concern

[4] Reported by USDA/UMASS gypsy moth project, but not confirmed.

* Species confirmed at Camp Edwards

Source: Camp Edwards, 1996

3.4.3.4 Fish and Other Aquatic Life

Osborne and Edmunds Ponds support fish populations consisting of largemouth bass (*Micropterus salmoides*), chain pickerel (*Esox niger*), yellow perch (*Perca flavescens*) and brown bullhead (*Ictalurus nebulosus*). Other possible fish species occurring at MMR include minnows (*Phoxinus* sp. and *Pimephales* sp.) and various sunfish (*Lepomis* sp.) (Automated Sciences Group, 1994). Small populations of these fish may exist in some of the other permanent kettle hole ponds on MMR.

Numerous species of freshwater invertebrates are expected to occur in surface water bodies and wetlands at MMR, including crustaceans (e.g., cladocerans such as *Daphnia* sp. and amphipods such as *Gammarus* sp.) and insects (e.g. dragonflies/damselflies [Order *Odonata*], mayflies [Order *Ephemeroptera*], caddisflies [Order *Trichoptera*], true bugs [Order *Hemiptera*], beetles [Order *Coleoptera*], flies and mosquitoes [Order *Diptera*]) (Automated Sciences Group, 1994).

3.4.3.5 Wildlife Management Practices

The Otis Fish and Game Club assists the Massachusetts Division of Fisheries and Wildlife with controlled deer hunting within Camp Edwards. Since 1956, portions of MMR have been open for deer hunting by permit only. In 1990 the Massachusetts Division of Fish and Wildlife set an annual limit of two deer per hunter. Currently, the entire western portion of MMR is available for deer hunting. No other mammals or birds are legally hunted on MMR (Automated Sciences Group, 1994).

3.4.4 Rare, Threatened, or Endangered Species and Habitats of Special Concern

Published documents such as the Cape Cod Critical Habitats Atlas (Association for the Preservation of Cape Cod, 1990) and the Massachusetts Natural Heritage Atlas (Massachusetts Division of Fisheries and Wildlife, 1994) were consulted to identify potential locations of special concern, threatened, or endangered species and habitats of special concern. Information regarding records of special concern, threatened, and endangered species was requested and received from the U.S. Fish and Wildlife Service (USFWS, 1995) and from the National Heritage and Endangered Species Program (NHESP) (Massachusetts Division of Fisheries and Wildlife, 1995). Additional information was obtained from the Camp Edwards Floristic Survey Reports (Jenkins, 1995a) and the annual survey reports from the Camp Edwards Environmental Protection Office (Camp Edwards, 1996). Available information regarding federal- and state-listed species, and habitats of special concern is discussed below.

3.4.4.1 Federal

The response from the USFWS and available survey results indicated that there are no known federal endangered or threatened plants or wildlife species occurring on MMR (USFWS, 1995).

3.4.4.2 State

No known state-listed endangered or threatened species of mammals, amphibians or fish currently occur on MMR. However, a number of plants, invertebrates, birds, amphibians and reptiles which are either state-listed or are species of special concern are known to occur at MMR and are discussed below.

Plants. Several listed plant species (or species of special concern have been observed on MMR; these include three state endangered species [(horse gentian (*Triosteum perfoliatum*), ovate spikerush (*Eleocharis ovata*), and Torrey's beak rush (*Rhynchospora torreyana*)], one state threatened species [adder's tongue fern (*Ophioglossum pusillum*)], two state special concern species [sandplain flax (*Linum intercursum*) and star grass (*Hypoxis hirsuta*)], and three state watch list species [hyssop hedge nettle (*Stachys hyssopifolia*), Nuttal's milkwort (*Polygala nuttallii*), and umbrella grass (*Fuirena pumila*)] (NHESP, 1995; Jenkins, 1995a).

Sandplain flax *(Linum intercursum)* is listed as a species of special concern and was documented as occurring at MMR near the Sandwich Gate in 1984 (Massachusetts Division of Fisheries and Wildlife, 1995). Subsequently, a floristic survey was conducted and the sandplain flax was not found at the documented site (Jenkins, J., 1995a). However, a similar species, *L. medium* which is easily confused with *L. intercursum*, was identified. The floristic survey concluded this previous record was a misidentification. This area was checked again on several occasions in both 1995 and 1996, and *L. intercursum* has not been located on any of these visits.

Invertebrates. A long-legged green darner (*Anax longipes*), a state species of special concern, was recorded on the western edge of the impact area near Succonsette Pond in May 1995 (Camp Edwards, 1996). Three invertebrate species of special concern: New England bluet (*Enallagma laterale*), barrens bluet (*E. recurvatum*) and tule bluet (*E. carunculatum*) have been documented as occurring on private and town-owned land near MMR (Massachusetts Division of Fisheries and Wildlife, 1995). These species are odonates (dragonflies and damselflies) and are known to occur in ponds adjacent to the unnamed ponds on the property leased by the Otis Fish and Game Club. Gerhard's underwing moth (*Catocala herodia gerhardi*) and the spiney oakworm (*Anisota stigma*) are threatened species documented on MMR in 1985 (Massachusetts Division of Fisheries and Wildlife, 1996).

Barrens daggermoth (*Acronicra albarufa*) and Melscheimer's sack bearer (*Cicinnus melscheimeri*) are two additional state threatened invertebrate species with known to occur at MMR. The following state species of special concern are also known to occur at MMR: coastal healthland cutworm (*Abagrotis crumbi benjamini*), blueberry sallow (*Apharetra purpurea*), straight lined mallow moth (*Bagisara recrifascia*), pine barrens itame (*Itame inextricata*), coastal swamp metarranthis (*Matarranthis pilosaria*), and pine barrens zale (*Zale* sp.) (Lloyd Center for Environmental Studies, 1996).

Birds. The upland sandpiper is a state endangered species known to nest in the fallow areas associated with the Otis ANGB (see Table 3-17). The grasshopper sparrow and vesper sparrow are state-threatened species and the northern harrier is a state species of special concern known to occur at MMR. The barn owl (*Tyto alba*), a species of special concern, was recorded as occurring on MMR in 1991 (Massachusetts Division of Fisheries and Wildlife, 1995).

One northern harrier was detected during a grassland bird survey in 1995 and another was detected during bird surveys in the impact area (see Table 3-17). It is likely that these sightings represent two breeding pairs on MMR in 1995. Other state-listed birds identified during surveys include: sharp-shinned hawk; Cooper's hawk; common loon; and common tern. The hawks may have been late migrants, although they also may have potentially nested on MMR. Loons and terns were observed in flight, passing over MMR (Camp Edwards, 1996).

Amphibians/Reptiles. The four-toed salamander is a species of special concern known to occur on MMR (see Table 3-18). This species is usually found near sphagnum areas adjacent to woods. Their larvae are aquatic, but the adults are terrestrial (Conant, 1975). The eastern box turtle is a species of special concern known to occur on MMR (see Table 3-18). Eastern box turtles generally prefer forested areas, although they are found in field edges, thickets, marshes, bogs and stream banks (DeGraaf and Rudis, 1986). They prefer open deciduous forests containing logs or decaying vegetation for burrowing (Massachusetts Division of Fisheries and Wildlife, 1987).

3.4.4.3 Habitats of Special Concern

Priority Habitat of Rare Species and Natural Communities. The NHESP has designated all of MMR as Priority Habitat of Rare Species and Natural Communities because of the occurrence of the state listed wildlife species discussed above. The ponds associated with the Otis Fish and Game Club have been designated as Estimated Habitat of Rare Wetlands Wildlife because of the occurrence of state-listed invertebrates in adjacent ponds located on private or town-owned land.

Vernal Pools. Vernal pools are seasonal water bodies that hold water for at least two consecutive months in the spring and/or summer during most years and are free of fish. Amphibians such as the wood frog, spotted salamander, and fairy shrimp (Order *Anostraca*) breed exclusively in vernal pools and other fish-free waters. Vernal pools are considered to be habitats of special concern because they are the only breeding habitat for several amphibian and invertebrate species and may support state-listed rare salamander species (310 CMR 10 Part 1 Section 10.04).

Wetlands and wet areas with vernal pool attributes (i.e., amphibian egg masses, annual drawdown of water) were sampled extensively on MMR in 1995, and no state-listed species were detected (see Figure 3-7). Raccoon Swamp-D, located near the northern boundary of MMR, appears to have the classic characteristics of a vernal pool. Other wetlands and wet areas at MMR have at least some vernal pool attributes. Wetlands and wetland areas surveyed in 1995 are summarized in Table 3-19.

Table 3-19
Wetlands and Wet Areas with Vernal Pool Attributes

Wetland Name	Egg Masses	Annual Drawdown	Comments
A-2 Pond	No	Yes	American toad, singing males
Bailey's Pond	No	No	Green frog, juveniles
Cranberry Bog [1]	Yes	No	> 3 unidentified masses
Elliman Ditch [2]	No	Yes	Spring peeper, larvae
Gibbs Cattail Ditch [2]	Yes	Yes	Gray treefrog, larvae American toad, juveniles Spotted salamander, larvae
Gibbs Pond	No	Yes	Spring peeper, juveniles Gray treefrog, larvae Spotted salamander, juveniles
Grassy Pond	No	Yes	Spring peeper, larvae Wood frog, singing male
IBC Ditch [2]	No	No	American toad, larvae Bullfrog, tadpoles Spotted salamander, larvae
Monument Swamp [1]	No	No	American toad, singing males
Raccoon Swamp - A	Yes	No	Gray treefrog, larvae Green frog, juveniles Wood frog, juveniles Spotted salamander, larvae
Raccoon Swamp - B	No	No	Wood frog, juvenile
Raccoon Swamp - D [3]	Yes	Yes	Spotted salamander, larvae Wood frog, juveniles > 41 unidentified masses
Spruce Swamp	No	No	Green frog, larvae
Turpentine Ditch [2]	No	Unknown	Unidentified tadpoles, 1994

Table 3-19 (Continued)
Wetlands and Wet Areas with Vernal Pool Attributes

Wetland Name	Egg Masses	Annual Drawdown	Comments
Wagner's Corner Ditch [2]	No	No	Green frog, juvenile Bullfrog, juvenile Spring peeper, larvae
York Ditch [2]	No	Yes	Gray treefrog, larvae

[1] Former commercial cranberry bogs.
[2] Wet habitat that resulted from water accumulation in vehicle tracks or roadside drains.
[3] Appears to be "classic" vernal pool.
Source: Camp Edwards, 1996.

Critical Habitats. Within the MMR boundary, three ponds located NE of the Otis rotary (leased by the Otis Fish and Game Club) and sandplain grasslands at an abandoned gravel pit north of Otis ANGB were identified as critical habitat by the Massachusetts Division of Fisheries and Wildlife as coastal plain pond shore habitats.

3.5 Social Environment

This section presents a baseline description of Land Use, Cultural Resources, Hazardous Materials and Waste Management, Utilities, and Transportation.

3.5.1 Land Use

This section discusses existing land uses and development regulations both on MMR and on adjacent lands within the surrounding towns of Bourne, Falmouth, Sandwich and Mashpee.

3.5.1.1 Installation Land Use

MMR is comprised of approximately 21,000 acres of land that can be divided into three general areas 1) the cantonment area, 2) the training area, and 3) the airfield area (see Figure 2-3). With multiple military, military-related, and non-military occupants, all of these areas have a range of uses which are described in the following paragraphs.

Cantonment Area. Most MMR military occupants have some facilities in the cantonment area (see Figure 2-4). Just west of the airfield is the installation's main complex of offices, classrooms, and laboratories. MAARNG shops and maintenance facilities, USMC facilities, and a USDA research facility are dispersed throughout the central part of the cantonment area. On the northern edge of the cantonment area, bordering the training area, is the UTES. A WWTP is located near the Falmouth Gate along the southern boundary.

The western two-thirds of the cantonment area is occupied primarily by residential, recreational and institutional land uses. Uses here include a USCG-maintained golf course, family housing and MAARNG Troop housing. Within the residential area are four public schools that are part of the Bourne school system. Along the western boundary of the cantonment area is a national cemetery operated by the VA.

Training Area. The MMR training area is used primarily for military training and related facilities. The core of the training area is a large off-limits impact area into which live ammunition is fired. All firing ranges are oriented toward the impact area. Overlooking the ranges, a series of range towers and observation posts surround the impact area. East of, and immediately adjacent to, the impact area is the USCG transmitter site and Textron Cape Operations, a private company that loads, assembles and tests developmental tactical ordnance.

Due north of the impact area is the USAF Cape Cod Air Station. North and west of the impact area are two landing zone training areas. In the southwestern portion of the training area, adjacent to the national cemetery and the landfill, is a large tank/infantry and landing zone training area. Also in this area, along the Bourne boundary and adjacent to the MMR Main Gate is the Otis Fish and Game Club. Due west of the impact area along MMR's western boundary, is a Bourne municipal water storage facility and the Bourne landfill.

Airfield Area. The airfield is located in the southeastern portion of MMR. This area is dominated by the two runways. The NW/SE runway (main runway) is approximately 9,500 ft long, while the NE/southwest (SW) runway is approximately 8,000 ft long. Concentrated around the airfield, aprons, and taxiways, are various MAANG and USCG workshops and maintenance facilities, MAARNG helicopter/aviation facility, a fire station, the existing air traffic control tower, and an FAA building.

3.5.1.2 Surrounding Land Use

Due to the extent of MMR, many land uses surround the installation (Figure 3-8). MMR lies partially within and borders four towns, Sandwich, Bourne, Mashpee, and Falmouth. In general, the land uses surrounding MMR are forests and farmland interspersed with low density residential and commercial development and some limited mining. The following text presents a more detailed description of the existing land uses surrounding MMR by town.

Sandwich. The town of Sandwich borders MMR to the NE and east. Several low and medium density residential subdivisions are located between the MMR boundary and Route 130 near Snake Pond. This area is the most densely populated area adjacent to MMR in any of the four neighboring towns. North of these subdivisions, Route 130 forms the eastern boundary of MMR. In this area across Route 130 are an industrial park, low

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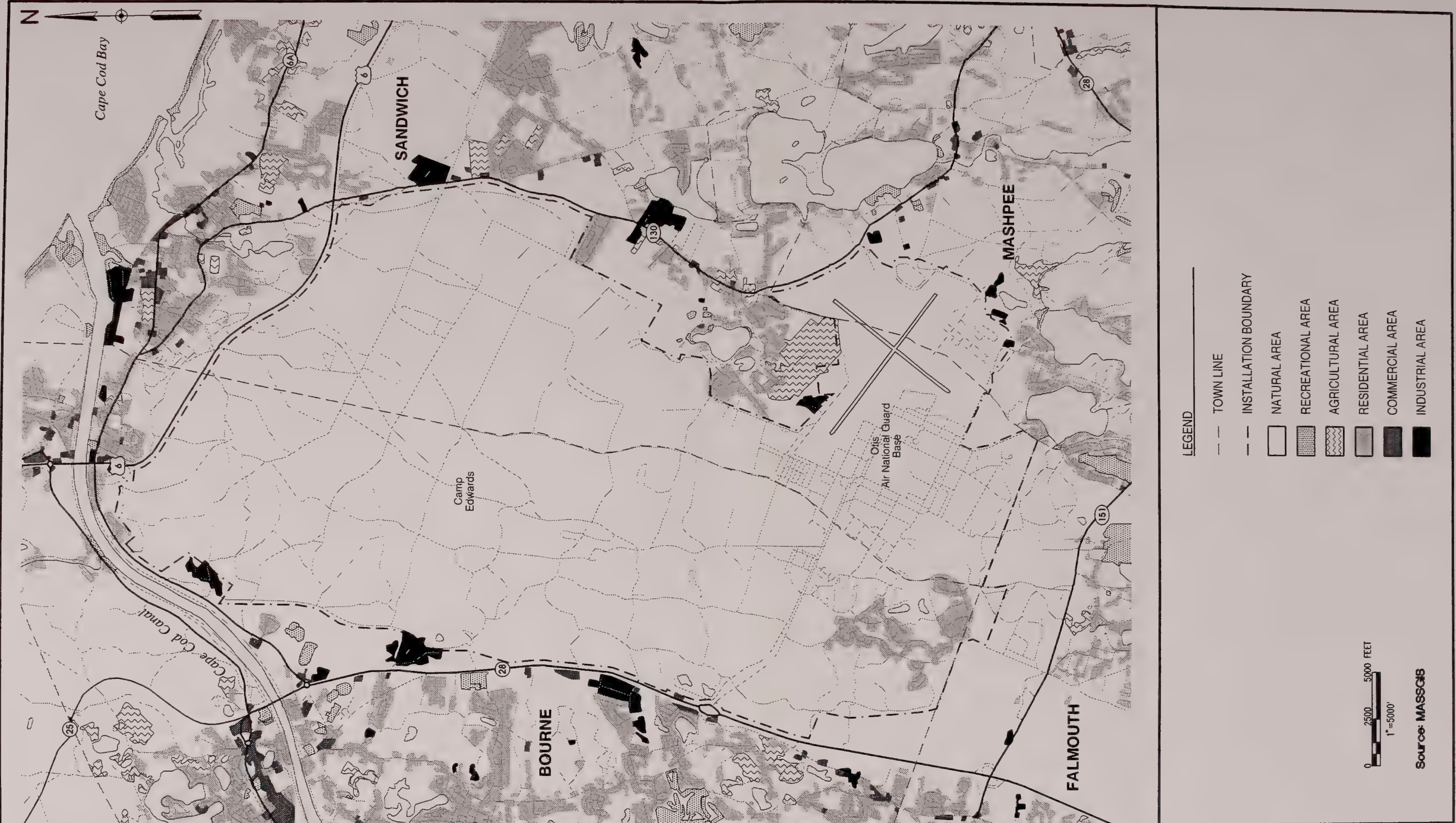

SURROUNDING LAND USE AT MMR

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Figure 3-8

intensity commercial, and low and medium density residential uses. The northern boundary of MMR abuts U.S. Route 6. The land across Route 6 is occupied by the Shawme-Crowell State Forest. There is no development within the state forest. Country Farm Estates is located on approximately 224 acres of land in Sandwich, adjacent to Otis ANGB. The farm is sited on prime soils and is protected under an Agricultural Preservation Restriction hold by the Commonwealth of Massachusetts.

To the north of MMR are two water bodies designated by the Commonwealth of Massachusetts as Surface Water Protection Districts: Upper Shawme and Shawme Lakes. To the east of MMR are two water bodies also designated as Surface Water Protection Districts, Snake Pond and Weeks Pond, and many smaller ponds.

Bourne. The town of Bourne comprises the northwestern and western boundaries of MMR. Part of the northern boundary abuts U.S. Route 6 and the undeveloped Shawme-Crowell State Forest. Moving west along Alternate Route 6, there is a large gravel pit that abuts MMR property. There is also some newer residential infill development and a picnic/camping area along the Cape Cod Canal.

Route 28 parallels MMR along its western boundary. With the exception of a municipal landfill, there is no development within the narrow strip of land between Route 28 and the installation. This area is expected to remain undeveloped given the limited access status of Route 28. Across Route 28 from MMR are a mix of low and medium density residential, small-scale retail, and light industrial uses. A cranberry bog is located southwest of the MMR Main Gate rotary.

Mashpee. The town of Mashpee borders a small segment of MMR's southeastern boundary. The land immediately adjacent to MMR is heavily forested with several small mining operations. An area of low density single family homes and a trailer park is located south of Otis Airfield surrounding Ashumet Pond and Johns Pond. There is also a 30-acre cranberry bog SE of the airfield.

Falmouth. The town of Falmouth lies south of MMR, and for the most part, shares its corporate limits with the MMR boundary. However, a small part of MMR extends into Falmouth just south of the military housing area. Most of Falmouth that borders MMR lies within the Crane Wildlife Management Area which is operated by the State Division of Fisheries and Game for game propagation and management. The Management Area includes 1,351 acres plus 265 acres in woodlot strips. There is no development within the Crane Wildlife Management Area.

3.5.1.3 Land Use Controls and Regulations

Some MMR occupants have established specific management guidelines to ensure compatibility of their activities with adjacent land uses. These guidelines generally address issues of public safety, noise control and environmental protection.

To ensure that existing activities at Camp Edwards are compatible with existing uses on- and off-base, MAARNG has identified SDZs for munitions storage facilities; implemented Range Safety regulations for the Camp Edwards Training Site; and constructed the Greenway Road Bypass to reduce convoy traffic along the eastern installation boundary. In addition, MAARNG has implemented an ICUZ Program to ensure that land use remains compatible with present and future noise environments.

MAANG has developed an AICUZ study for all aircraft flying activity at Otis ANGB. The study outlines the location of runway clear zones, aircraft accident potential zones and noise contours and recommends compatible land uses for areas in the vicinity of the base. It includes recommendations for communities to incorporate into their community plans, zoning ordinances, subdivision regulations, building codes, and other related documents. The majority of 102FW flying activity takes place over the ocean to fulfill mission and training requirements, enhance training safety, and avoid community disturbances. Flight corridors have also been selected to minimize noise levels on surrounding communities. Aircraft departing from Otis ANGB avoid populated areas as much as possible and climb as steeply as is consistent with safety to reduce noise impacts. Runway 32 has been designated as the primary noise abatement runway and is preferred for takeoff. Use of this runway allows aircraft to reach a higher altitude prior to leaving the base. Takeoffs are normally not performed using afterburner power in order to reduce noise levels. Flying hours are normally 7:30 a.m. to 10:00 p.m (MAANG, 1996).

The other MMR occupants also have considered land use compatibility in their decision-making. The USCG, USAF, and VA follow their organizations' guidance in developing capital improvements and maintenance programs for their facilities to ensure compatibility with adjacent land use.

Local Zoning. The towns within which MMR is located (Sandwich, Bourne, Falmouth and Mashpee) have instituted land use controls throughout their jurisdictions. Existing MMR land uses comply with most requirements of the applicable zoning districts, however, MMR being state property is not subject to these local zoning regulations.

3.5.2 Cultural Resources

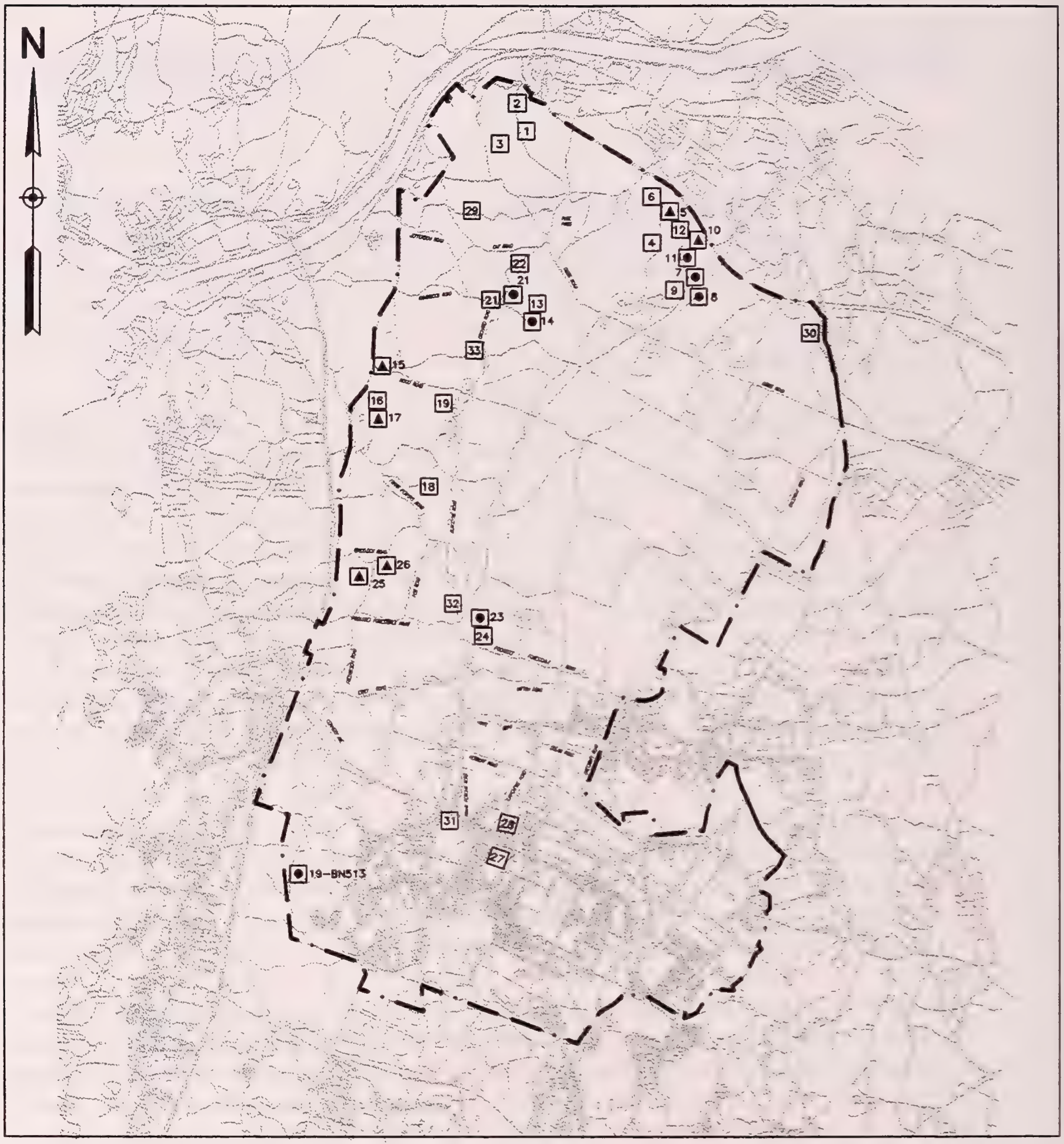
This section presents an overview of archeological and historic architectural resources at MMR.

3.5.2.1 Archeological Resources

There have been four cultural resource surveys conducted within MMR that have assessed the base-wide potential for the presence of prehistoric and historic archeological resources. Background research and field investigations have located and identified historic resources and a number of prehistoric archeological sites. All cultural resource investigations were conducted under permit from the Massachusetts Historical Commission (MHC).

Overview of Completed Archeological Investigations. The first systematic archeological investigation completed at MMR was a cultural resource reconnaissance survey conducted in conjunction with projects proposed as part of the 1985 Master Plan. The reconnaissance survey stratified areas within MMR into zones of high, moderate and low archeological sensitivity, with the exception of those areas designated off limits. In addition, limited subsurface testing was conducted on a sample of the project area resulting in the identification of six prehistoric sites and six locations containing isolated low density deposits of prehistoric material (find spots). A 33-acre sample, divided into 33 blocks each containing 10 acres, was tested with 675, 50-by-50-cm test pits (Figure 3-9). Evidence of historic period activity was limited to portions of a stone wall associated with one of two historic farms located along Avery Road and Monument Swamp Road (Davin and Gallagher, 1987).

Two intensive (locational) archeological surveys were conducted for the proposed wastewater treatment facilities at Otis ANGB (Macomber, 1991; Herbster and Davin, 1992). The proposed project included the construction of an infiltration basin system, a pumping station/wet well, and approximately 50,000 ft of force-main pipeline to connect the pumping station to the infiltration basin system (Figure 3-10). The 1991 survey was limited to the construction impact area of the proposed force-main pipeline and infiltration basin system as plans for the pumping station/wet well were not finalized at the time of the 1991 survey. The archeological sensitivity of the project area was considered to be moderate to high (Macomber, 1991). During the walkover portion of the 1991 intensive survey, three projectile points and a bitface perform were recovered from the ground surface. A total of 361 test pits, 50-by-50-cm, were excavated during subsurface testing. Although low densities of chipping debris and a projectile point fragment were recovered from three of the test pits, none of the recovered artifacts were considered to represent significant archeological deposits and no further archeological investigation was recommended for the infiltration basin system area and the force-main pipeline. However, it was recommended that the approximately three-acre section of the project area to be used for the construction of the proposed pumping station/wet well be surveyed when the plans for that portion of the wastewater treatment facilities were finalized.



LEGEND

— · — — · — — INSTALLATION BOUNDARY

200 x 200 m Testing Block:

☐ with no cultural material

● with a site

▲ with a find spot

0 4000 8000 FEET

1" = 8000'

Source: Davin and Gallagher, 1987

Cultural Resource Reconnaissance Survey Testing Locations

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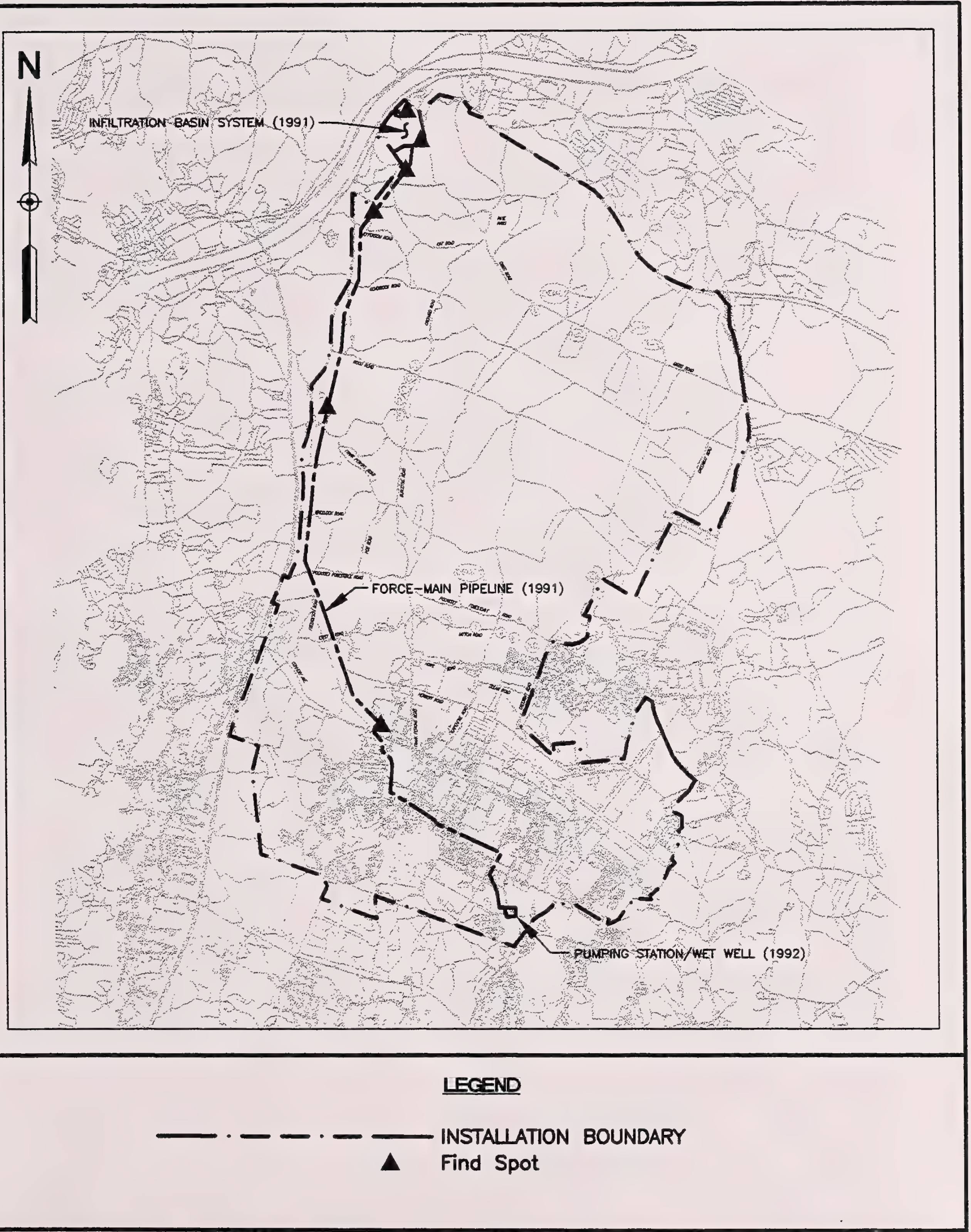
Figure 3-9


N
INFILTRATION BASIN SYSTEM (1991)
FORCE-MAIN PIPELINE (1991)
PUMPING STATION/WET WELL (1992)
LEGEND
INSTALLATION BOUNDARY
▲ Find Spot

0
4000
8000 FEET
1"=8000'

Source: Macomber, 1991; Herbster and Davin, 1992

Wastewater Treatment Facilities Survey

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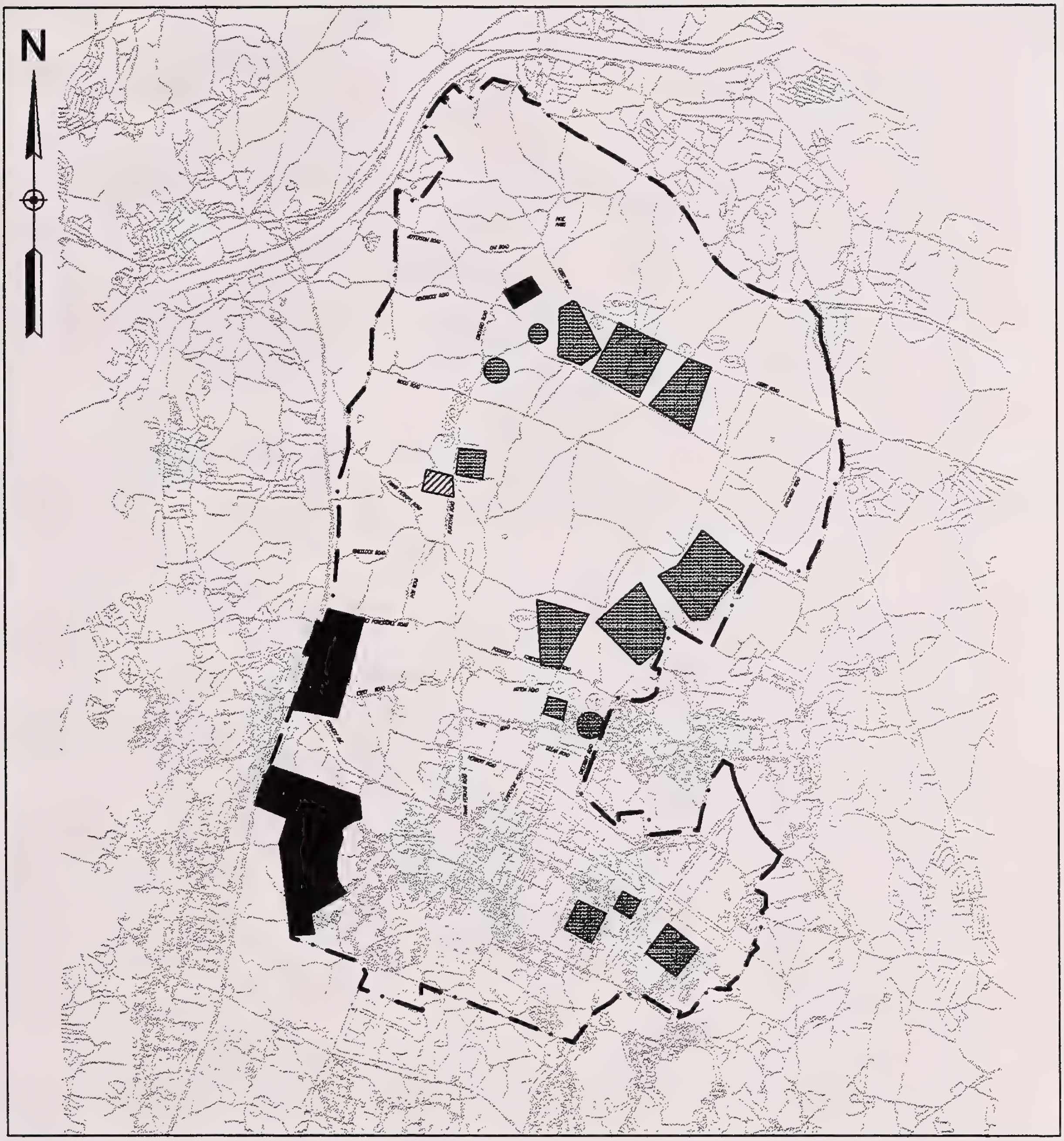
Figure 3-10

When plans for the wastewater treatment facilities were completed in 1992, an additional intensive survey was conducted to investigate the proposed pumping station/wet well portion of the project area not previously testing during the 1991 intensive survey (see Figure 3-10). No prehistoric or historic period resources were recovered during subsurface testing of the approximately three-acre portion of the wastewater treatment facilities and no additional archeological investigations were recommended (Herbster and Davin, 1992).

In 1995, a cultural resource reconnaissance survey was conducted on the off-limits areas within MMR not previously examined during the 1987 survey. The goal of the 1995 survey was to ensure that a base-wide assessment including all alternative locations analyzed in this EIS/EIR were evaluated. The Impact Area, J3 Range, and the proposed ISBC Scenario 2 alternative location were not examined because they were considered unsafe due to the potential presence of unexploded ordnance. However, due to past activities and ground disturbances, these areas are considered to have low archeological sensitivity (Davin, 1995).

As a result of these investigations, the alternative locations and the entire MMR property has been assessed for the potential to contain archeological resources (Figures 3-11 and 3-12, respectively). Of the 20,915 acres at MMR, approximately 375 acres are classified as having a high potential to contain prehistoric resources; 6,150 acres have a moderate potential to contain prehistoric resources; and 14,310 acres have a low potential to contain prehistoric resources. In addition, 80 acres have a moderate potential to contain historic resources.

Research Contexts. In order to understand the nature of prehistoric occupations located in MMR, a general view of the regional prehistory is required. Cultural chronologies and settlement pattern models formulated for southeastern New England provide a framework for understanding where Native Americans lived and how their life-ways changed through time. By examining site locations across spatial and temporal landscapes as well as examining material culture and features, patterns emerge that are more easily understood when assessed as part of the regional environmental and archeological record. Cultural resource management surveys conducted in the mid- and inner-Cape Cod area indicate that the environment plays a key role in the location of prehistoric sites (Davin and Gallagher, 1987; Herbster and Davin, 1992). The presence of numerous prehistoric sites in proximity to kettle ponds and swamps within the moraines located along the western and northern portions of Cape Cod indicates that these landscape features were an important part of the prehistoric land use pattern. Archeological investigations at kettle pond locations in the Sandwich moraine found evidence of Paleoindian Period (12,500-10,000 before present [B.P.]) through Contact Period (450-300 B.P.) occupation.



LEGEND

— · — — · — — INSTALLATION BOUNDARY

▤ Low Sensitivity

▨ Moderate Sensitivity

■ High Sensitivity

0 4000 8000 FEET

1"=8000'

Source: Davin, 1995

Archeological Sensitivity Assessment, Alternative Locations

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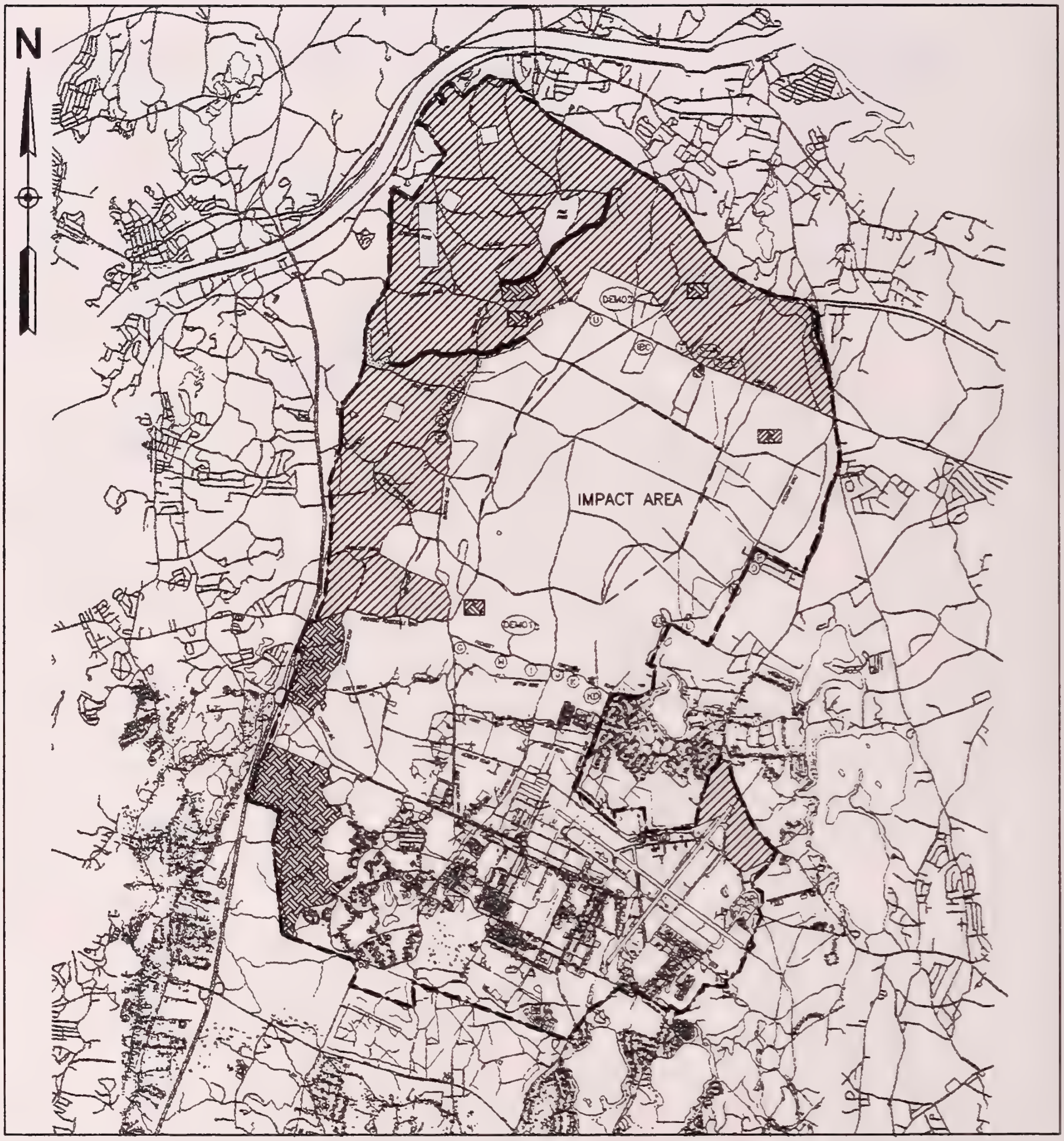
Figure 3-11



LEGEND

▩ HIGH SENSITIVITY
▨ MODERATE SENSITIVITY
☐ LOW SENSITIVITY
■ MODERATE HISTORIC SENSITIVITY
-·--·-- INSTALLATION BOUNDARY

0 4000 8000 FEET
1"=8000'

Source: The Public Archaeology Laboratory, Inc.

ARCHEOLOGICAL SENSITIVITY ASSESSMENT, MMR

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Figure 3-12

A comparative framework for historical cultural resources in differing environments is provided by the MHC in its statewide survey of the Commonwealth's cultural resources. The MMR landscape is the product of 350 years of alteration by European settlers, early colonists, Cape Cod farmers, woodsmen and military personnel. Its documented history and that of the vicinity contains information concerning generalized patterns of regional land use that can be viewed within a core/periphery model (Davin and Gallagher, 1987). Settlement patterns and environmental aspects demonstrate that MMR has been consistently utilized as an extractive resource base which places it in a peripheral zone rather than a zone of core-like activities (Davin and Gallagher, 1987).

Complete prehistoric and historic cultural chronologies and contexts for southern New England as well as their implications for sites located within MMR can be found in the individual survey technical reports (Davin and Gallagher, 1987; Macomber, 1991; Herbster and Davin, 1992; Davin, 1995).

Methodology. The reconnaissance and intensive (locational) archeological surveys involved both background research and fieldwork to evaluate the archeological sensitivity of MMR and to locate prehistoric and historic period cultural resources. As a result of these archeological investigations, the entire MMR has been assessed for the potential to contain archeological resources. The primary factors used in the stratification of MMR were environmental features, amount of disturbance or physical integrity, and the presence or absence of prehistoric sites or historic period resources dating prior to the establishment of MMR. Sources consulted during the background research included Massachusetts cultural resource inventories, cultural resource management studies, town histories and maps, and an examination of soil and vegetation maps. A walkover survey of the entire MMR was conducted to examine the existing physical environment as well as to locate any indications of prehistoric or historic land uses of the project area.

Prehistoric Resource Sensitivity. Areas assessed as having high potential to contain prehistoric resources include those with good to excellent physical integrity, the presence of freshwater resources, sandy well-drained soils, and/or known prehistoric sites. Moderately sensitive areas are characterized by good to excellent physical integrity and/or the presence of isolated find spots of prehistoric cultural material. Freshwater resources are generally, but not always, located more 150 m away. Soils ranged from sandy well-drained to cobbly. Areas with low potential to contain prehistoric resources are characterized by poor physical integrity, freshwater resources located more than 300 m away, cobbly soil conditions, and no prehistoric cultural material present.

Six of the seven prehistoric sites located within MMR were located adjacent to the freshwater kettle ponds or kettle swamps in the upland sections of MMR (Davin and Gallagher, 1987). These freshwater resources, often the only source of fresh water along the northern portion of the Cape Cod peninsula, are located in the Buzzards Bay and Sandwich moraines, where the two moraines intersect, or in lowlands immediately adjacent to them. The sites are situated in areas where sandy well-drained soils are present. The seventh site (19-BN-513), located in the Deer Horn Hill area by an avocational archeologist, does not appear to be near a source of fresh water. Other than its general location, little information is available on this site (MHC site files). While the locations of the other six prehistoric sites is known, the exact area encompassed by these sites remain unknown. Diagnostic artifacts recovered from the sites indicate that MMR was occupied from at least the Middle Archaic Period (8000-5000 B.P.) to the Late Woodland Period (1000-450 B.P.).

Six find spots were identified during the 1987 survey and an additional six find spots were located during the 1991 survey (see Figures 3-9 and 3-10). Eleven of the twelve find spots, which contained low densities of prehistoric cultural material, were located in the upland portions of MMR (Davin and Gallagher, 1987; Macomber, 1991). These find spots are situated on high knolls overlooking freshwater ponds or swamps and along the margins of shallow kettle wetlands. Soil in the find spot areas are sandy to very cobbly.

Historic Resources Sensitivity. Areas assessed as having a moderate potential to contain historic period resources dating prior to the establishment of MMR include areas with food to excellent physical integrity that are situated along historic period roads, near stone walls, and in locations shown as being farms on historic period maps. Two farms were located within the bounds of MMR during the nineteenth century to the early twentieth century. The majority of the land forming MMR came from the Coonamesset Sheep Ranch, which was reportedly the largest ranch east of the Mississippi River (Montgomery, 1991:2.1-3). Extractive industries such as lumbering and turpentine and charcoal manufactures are likely to have occurred prior to 1911 when military use of portions of MMR began.

The majority of MMR exhibits low potential to contain historic period resources due to its peripheral location relative to settlement areas as well as twentieth century impacts related to use of the area as a military installation.

3.5.2.2 Historic Structures

A historic properties survey was conducted at the former BOMARC guided surface-to-air facility to supplement previous historic property surveys at MMR. These surveys are summarized below.

Overview of Completed Historic Property Surveys. Under the NHPA, federal agencies are responsible for surveying agency-controlled historic properties and nominating them to the National Register of Historic Places (NRHP).

The DoD undertook a survey of World War II temporary buildings. The 1200 and 1300 blocks at Camp Edwards were included in this survey. The study resulted in a determination that the buildings are eligible for inclusion in the NRHP. A Programmatic Agreement among the DoD, the Advisory Council on Historic Preservation (ACHP), and the National Conference of State Historic Preservation Officers (SHPOs) stipulated the recordation of the structures to Historic American Buildings Survey Level II standards and allowed for their subsequent demolition. The Camp Edwards buildings were documented in 1990 (USACERL, 1990).

Camp Edwards conducted a standing structures survey in 1989 (U.S. Army Construction Engineering Research Laboratory, 1989). This study concluded that with the exception of the 112 World War II temporary buildings, no other structures were considered eligible for inclusion in the NRHP.

The BOMARC complex was surveyed in 1996 and is currently being reviewed for eligibility for inclusion in the NRHP. A summary of the survey is provided below.

BOMARC Complex Survey. A locational inventory for historic properties was conducted at the former BOMARC facility at MMR. A survey of the BOMARC site was undertaken to assist in compliance with the NHPA of 1966 as amended and other applicable laws and regulations. The survey work was completed in accordance with the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation (48 CFR 44716) and MHC standards.

Historic Context. The BOMARC facility was surveyed and documented on a MHC Area Form A. A copy of the survey form is included in Appendix G.

A Cold War-era historic properties context for the U.S. Army is currently being developed through several efforts. Therefore, a determination of NRHP eligibility for the BOMARC site has not been prepared or implied in this work effort. When made available, the Army will use the context to appropriately evaluate this site as a component of a nationwide military context, rather than conducting a duplication effort in requiring a context and evaluating the resource as a stand alone entity.

Methodology. The tasks associated with the documentation of the BOMARC missile facility included background research and fieldwork. Background data collection and analysis included a literature search of primary and secondary materials and a review of the facility's history, maps and plans. A walkover and visual inspection was also conducted to assess the physical condition and integrity of the landscape and the exterior and interior of all structures, and to collect photographic and written documentation of the site. An MHC "A" area survey form incorporating this information was prepared for all buildings and structures within the BOMARC complex (Appendix G).

3.5.2.3 Native American Resources

Any cultural material collected during previous or subsequent archeological investigations conducted by PAL Inc. will be curated and repatriated if applicable according to NAGPRA, ARPA, 36 CFR 79, and AIRFA.

3.5.3 Hazardous Materials and Hazardous Waste Management

This section describes the hazardous materials and hazardous waste management activities at MMR. An overview of hazardous materials management, hazardous waste management, and wastewater is presented below.

3.5.3.1 Hazardous Materials Management

Activities at MMR require the use of hazardous materials. Hazardous materials at MMR are received and stored in bulk, or in 55-gallon drums or smaller containers. Each occupant has developed management plans that identify procedures for hazardous materials storage and spill prevention and cleanup. All hazardous materials at MMR are managed in accordance with applicable federal, state, and local regulations.

Storage Tanks. Petroleum products such as diesel fuel, gasoline, motor gasoline, jet petroleum and propane used at MMR are stored in bulk in underground and aboveground storage tanks (USTs and ASTs). The number of active storage tanks is summarized as follows: MAARNG operates one UST and four ASTs; MAANG operates 13 USTs and 11 ASTs; USCG operates no USTs and 18 ASTs; Cape Cod Air Station operates no USTs and seven ASTs; USMC operates no storage tanks; Textron operates no USTs and four ASTs; USDA operates no storage tanks; and the VA operates three USTs and two ASTs. MAARNG and MAANG perform annual tank tightness tests on the USTs while weekly visual inspections of the ASTs are conducted by MAARNG, MAANG and USAF. The USCG performs daily inspections of ASTs. ASTs are anticipated to be used exclusively to meet future (new) storage tank demands at MMR.

Asbestos. Numerous facilities throughout MMR were constructed using asbestos-containing building materials. Because much of MMR was developed in the 1950s, asbestos-containing building materials are expected to be encountered in at least some of the facilities.

Each of the occupants at MMR have conducted, or plan to conduct, asbestos management activities including surveys, encapsulation, removal, management in place as necessary and will continue to manage asbestos-containing materials (ACM) in accordance with applicable federal, state and local regulations, and each occupant's asbestos management plan. An asbestos survey program for the Otis ANGB was conducted in August 1987. Asbestos was identified in Buildings 122, 126, 128, 131, and 163 in addition to other facilities on Otis ANGB. Building 3122 has not been surveyed to date. Camp Edwards conducted asbestos surveys throughout the mid to late 1980s and many asbestos abatement actions have been completed since then. UTES was not included within these surveys. Asbestos inspections of Range facilities on Camp Edwards have not been conducted to date; however, ACM is not expected to be found because most of these buildings are unheated and were constructed using unfinished wood and/or corrugated metal. The USCG identified ACM at the air station. Abatement actions are currently ongoing and should be completed in FY 1996. The USAF conducted asbestos surveys. For the most part, asbestos has been found secure and non-friable, while a small number of areas have been identified for abatement or removal of ACM.

The Consent Decree requires this EIS/EIR to address "the need for comprehensive on site (or off site near vicinity) ambient air quality monitoring for the entire MMR for asbestos", and "the need for and availability of resources relating to asbestos removal from existing structures at MMR and the impact of shortfalls in asbestos removal resources". As stated above, each of the occupants at MMR are managing ACM in accordance with applicable federal, state and local regulations using best management practices. In addition, asbestos removal has been and will continue to be conducted in accordance with applicable regulations which includes the requirement for air quality monitoring during asbestos removal to ensure asbestos levels do not exceed permissible exposure limits as established in 29 CFR 1926.

Lead-Based Paint. To date, MAARNG, MAANG, and USDA have not conducted lead-based paint surveys. The primary concern with lead-based paint is exposure to children. MAARNG, MAANG, and USDA do not provide family housing or daycare; therefore, it is unlikely children could come in contact with lead-based paint at other facilities should it exist. The USAF and VA have no known facilities with lead-based paint. The USCG conducted a paint survey in 1992 and abatement of lead-based paint is scheduled to be completed by FY 1996.

Pesticides. There is no bulk storage of pesticides on MMR. Pesticides are applied by licensed contractors who supply and dispose of pesticides.

Trained and licensed MAANG personnel apply limited amounts of Round-Up® and hire licensed civilian companies for any other applications, as necessary. Limited amounts of fungicides and fertilizers used on the golf course are stored by the USCG in Building 3350. Textron uses small quantities of commercially available insect repellents and hornet and wasp spray at their facility. The USDA also stores small quantities of pesticides in a storage annex shed next to Building 1398. The pesticides/herbicides are used only inside Building 1398. The shed is located above a holding tank to trap any spills. There is no on-site storage of pesticides at the VA.

Polychlorinated Biphenyls. Polychlorinated biphenyls (PCBs) have been identified in electrical transformers and switches at MMR owned and managed by MAANG. MAANG has a program to eventually replace all transformers that contain PCBs.

During August 1994, samples were collected from MAANG transformers, regulators, and primary switches and analyzed for PCBs (MAANG, 1994). Each piece of equipment was then labeled based on PCB content (less than 50 ppm, less than 499 ppm and >500 ppm), equipment number, and kilovolt-ampere (kVA) rating, in accordance with the TSCA. Material with a PCB content of less than 50 ppm is not regulated under TSCA. Transformers with PCB concentrations above 500 ppm are the first scheduled for removal and replacement, followed by those with PCB concentrations between 50 and 500 ppm. All PCB transformer/switches owned by the USCG have been removed and shipped for PCB disposal in accordance with all applicable federal and state regulations. There is no known equipment on the USAF, Textron, USDA or VA sites that contain PCBs. However, equipment with the potential to contain PCBs is managed in accordance with TSCA by all MMR occupants.

Radon. No radon surveys have been conducted at MMR. The Massachusetts Department of Public Health and USEPA conducted a joint radon study in 1988. The study concluded there is a low probability for radon to exceed 4.0 picocuries/liter in homes in Barnstable County (Massachusetts Department of Public Health, 1996).

Ordnance. Explosive materials are stored at MMR in the MAARNG stores supply point and MAANG munitions storage facility. These areas are labeled accordingly and have SDZs surrounding them to protect adjacent structures from explosions. Textron meets the requirements prescribed in DoD Contractor Safety Manual for Ammunition, Explosives, and Related Dangerous Materials (DoD 4145.62) for storage of ordnance at the J-3 range. The USCG stores signal flares in Building 3158 and operates an ammunition storage point (magazine) in the 3400 area. The remaining occupants at MMR do not use or store ordnance.

3.5.3.2 Hazardous Waste Management

A variety of hazardous wastes are generated by operation and maintenance activities at MMR. These wastes include fuel and oil wastes, solvents, paint wastes, and several other chemical wastes. Hazardous wastes at MMR are segregated, labelled, stored, manifested and disposed of in accordance with all pertinent federal and state regulations. Wastes are disposed of or recycled through private contracts with USEPA- and MADEP-licensed transporters and disposal contractors.

The Massachusetts National Guard has prepared a hazardous waste management plan entitled "Hazardous Waste Management Guidance", dated October 1994, which applies to the Army Guard and Air Guard facilities at MMR. This plan outlines requirements for the storage, labeling, monitoring and disposal of hazardous wastes. Training requirements for personnel managing and handling hazardous wastes are also described.

Additionally, the Guard has developed a "Hazardous Materials Management, Contingency Plan-Spill Prevention Control and Countermeasures", which outlines procedures for the prevention, control and cleanup of hazardous materials spills. Two draft plans, "Oil and Hazardous Material, Spill Prevention and Response Plan", and "Facility Response Plan", have also been prepared.

MAARNG is a large quantity generator ([LQG] greater than 1,000 kilograms (kg) per month of hazardous wastes or 1 kg of acutely hazardous wastes). As a LQG of hazardous waste, MAARNG may store an unlimited quantity of wastes in a designated storage area for up to 90 days. Prior to 90 days, the waste is properly transported and disposed off base at a licensed treatment, storage, and disposal facility. MAARNG maintains a hazardous waste storage facility at Building 4600. Additionally, up to 55 gallons of hazardous waste can be accumulated in areas where wastes are generated. These areas are designated as satellite accumulation points. MAARNG maintains five satellite accumulation points: Operational Maintenance Shop-6 (Building 2806), Operational Maintenance Shop-22 (Building S-2), Army Aviation Support Facility (AASF-Building 2816), UTES (Building 4601) and Building 2807. Hazardous wastes generated by MAARNG are primarily composed of waste oil, waste fuel, oily solids, contaminated fuels, various solvents and paint. MAARNG submits biennial reports to the MADEP that summarize manifest shipments.

Medical wastes generated at the MAARNG Infirmary (Building 1313) are disposed of by the USCG, or are collected and disposed of by a licensed medical waste contractor. Medical wastes generated by MAANG are collected and turned in to the USCG for disposal.

The USMC is a small quantity generator ([SQG], less than 1,000 kg per month and/or less than 1 kg of acutely hazardous wastes) including speedy-dry, oil filters, antifreeze, oil sludge and batteries. These wastes are disposed of by licensed contractors.

MAANG is also an LQG. MAANG has satellite accumulation points located in 15 buildings (Buildings 156, 158, 162, 165, 173, 175, 189, 190, 191, 194, 196, 432, 968, 971, and 6165). A 90-day accumulation point is located in Building 120. Hazardous wastes generated by MAANG (excluding contaminated soils) primarily include waste jet fuel, waste oils, PCB-containing transformers, and paint solids. Smaller quantities of compressed gases, alkaline liquids and mercury batteries are also generated. MAANG also manages wastes generated under the IRP. MAANG submits biennial reports to the MADEP summarizing manifest shipments.

The USCG is an LQG of hazardous wastes which are managed in accordance with their hazardous waste management plan and updated on an annual basis. The USCG maintains a hazardous materials storage building adjacent to Building 5215, and eight satellite accumulation points in Buildings 3160, 3161, 3350, 3170, 3172, 3424, 5202, and 5215. A 90-day accumulation point is located in Building 5209.

The Cape Cod Air Station is registered as an SQG. USAF primarily generates waste oil (approximately 94 percent), oily rags (4 percent) and waste corrosives (2 percent). Hazardous wastes are accumulated in a satellite accumulation point located on the third floor of Main Building (solvent rag collection) and in a second satellite accumulation point in the power plant building (oily wastes and antifreeze collection). These wastes are transferred to the hazardous waste storage shed for ultimate disposal by the Defense Reutilization Marketing Office (DRMO). Waste oils, collected in a vaulted aboveground tank, are also disposed of by DRMO.

Textron is a very small quantity generator ([VSQG] less than 100 kg/month and no acutely hazardous waste) according to MADEP regulations) of photographic wastes and automotive battery wastes. Photographic developing wastes are generated in a satellite accumulation point located in the X-ray developing portion of Building J-3-6. These wastes are managed in accordance with state regulations.

The USDA is a VSQG (total of approximately 55 gallons per year) primarily consisting of organic compounds and pesticides. These wastes are stored in Building 1398. A licensed waste disposal contractor collects and disposes these wastes.

The USDA also generates and stores biohazardous waste in Building 1398. Small quantities of waste (less than 1 microcurie) are generated from low-level, short half-life radioactivity used in the form of P-32 and S-35. These materials are stored on site until they have decayed to safe levels prior to disposal (20 weeks for P-32 and 30 months for S-35). A second source of radioactivity used at the USDA is cobalt-60 used in an irradiator. This is a sealed source, i.e., inaccessible to the user. No waste is generated and the irradiators are checked for contamination four times a year. The use of these isotopes is monitored by the Nuclear Regulatory Commission through the Radiation Safety Staff of the USDA.

The VA is not a registered generator; however, they do accumulate waste oils in a 55-gallon drum located at their accumulation point. Waste oil is removed from these drums at least once per quarter by a licensed contractor. Antifreeze is collected in commercial containers and recycled.

MAARNG and MAANG are substituting non-toxic products to reduce use of hazardous chemicals. The USCG and MAANG are implementing a Hazardous Materials Pharmacy Program. This program involves evaluating materials before purchasing, selecting nonhazardous substitutes, and buying in small quantities. USCG also recycles JP-8 emptied from aircraft during mandatory fuel checks. Clean samples of fuel are collected, stored and turned in to MAANG. MAANG gives the USCG a credit on the returned fuel. All MMR occupants using antifreeze have adopted antifreeze recycling programs.

Unserviceable ordnance and small quantities of explosive wastes are generated from on-post activities by MAARNG, MAANG, USAF, and Textron. MAANG disposes of these materials and out-of-date signal flares from USCG through an Air Force contract. Empty shell casings, ammunition boxes, and packing materials generated by the Camp Edwards ammunition supply point are disposed of through DRMO. Excess artillery powder bags are returned to the ammunition supply point and shipped back to the manufacturer by licensed commercial carrier contractors.

3.5.3.3 Wastewater Treatment and Disposal

Sanitary waste water, cooling and heating system discharges, and process wastes from MAANG, USCG, and MAARNG are generally discharged to the Otis WWTP. Other operations located within MMR discharge wastewater to septic systems or oil/water separators. Details of wastewater treatment and disposal at MMR are described below.

Wastewater Treatment Plant. The Otis WWTP is located at the southern boundary of MMR in the town of Sandwich at the Falmouth town line. The plant was constructed in 1936 to provide 0.9 million gallons per day (MGD) of primary wastewater treatment for Camp Edwards. A new WWTP began operating in late 1995. This state of the art facility is located at the southern boundary of MMR adjacent to the former WWTP, and provides tertiary (drinking water quality) treatment. Tertiary treatment is provided by the biological nutrient removal process whereby nitrogen is removed to required standards prior to discharge to sand filter beds near the Cape Cod Canal, 10 miles to the north. Monthly influent averages approximately 0.3 MGD while peak monthly influent is approximately 0.5 MGD.

Septic Systems. Not all wastewater generated at MMR is discharged to the WWTP. Septic systems and latrines are used by the VA, Cape Cod Air Station, the USCG, and Textron. Waste from these systems is disposed off post. Septic systems are pumped by licensed contractors and their contents disposed at licensed facilities. MAARNG also has three facilities (Buildings 3596, 4020, and 4030) with cesspools. However, Buildings 4020 and 4030 are currently being upgraded to Title V systems, and Building 3596 will be tied into the WWTP in FY 1996. In addition, several isolated MAANG buildings still use septic systems. Sanitary wastes from Buildings 986/767, and 176 are discharged to cesspools. Wastewater generated during MAARNG field training exercises are additional sources of wastewater discharge to septic systems or leaching pits. Wastewater generated during field training exercises (from field kitchens and personal hygiene) is disposed of through soaking pits and grease traps in accordance with the Camp Edwards Range Safety Regulation (MAARNG, 1994b). Wastewater from washracks at MMR are passed through oil/water separators prior to discharge to the sanitary sewer.

3.5.3.4 Installation Restoration Program

The IRP is a DoD program, implemented in 1980 for the identification, characterization, and remediation of environmental contamination on military installations. The program established a process to evaluate past disposal sites, control the migration of contaminants, and control potential hazards to human health and the environment.

Since the passage of SARA, USEPA has been evaluating the federal facility hazardous waste sites for inclusion on the National Priorities List (NPL). MMR was included on the NPL on November 21, 1989. The USAF is the lead agency responsible for the execution of the IRP at MMR. The Air Force Center for Environmental Excellence is the Remediation Program Manager as well as the Remedial Project Manager.

The IRP was originally divided into four phases. However, after SARA was passed, the IRP was realigned to incorporate the terminology used by the USEPA. The result was the creation of three action stages: (1) Preliminary Assessment/Site Inspection; (2) Remedial Investigation/Feasibility Study; and (3) Remedial Design/Remedial Action. Interim Remedial Actions can also be performed at any time during the process to accelerate response actions. A Decision Document is issued for comment and approval upon completion of any phase of the IRP. The USEPA issues records of decision upon approval of a remedial action. As discussed in Section 1.2.2, this IRP discussion is presented to provide a basewide description of the affected environment. CEQ and USEPA have determined that adherence to the procedural mandate of CERCLA/SARA is the functional equivalent of an EIS, providing adequate assurances that all environmental factors are given appropriate consideration. IRP activities are exempt from NEPA.

In 1982 the USAF initiated the IRP at the Otis MAANG portion of MMR. In 1986, the IRP was expanded to include sites at all MMR military units. The expanded program resulted in the identification of suspected contamination at 73 locations. Four additional sites have since been identified, bringing the total number of locations to 77. A listing of these sites and current status is provided in Appendix H. For more information regarding the IRP at MMR, refer to the Administrative Record located at the Otis ANGB IRP office.

3.5.4 Utilities

MMR is served by potable water, solid waste, stormwater, electricity, and natural gas utilities, each of which is summarized below.

3.5.4.1 Water Supply

MAANG provides drinking water for most of MMR. The primary water supply well (Well J) and the associated water distribution system serve the Cantonment Area (MAANG, MAARNG, and USCG), including all residential areas, industrial and general operating facilities, and all flight-line activities. Facilities farther from the industrialized portion of MMR are not served by the main water supply distribution system. The Ammunition Supply Point and Range Control buildings on Camp Edwards each have their own well. The VA Cemetery, Cape Cod Air Station, USCG (Transmitter Station), and Textron each maintain their own water supply wells. Water from Well J is transported in 400-gallon water trailers to MAARNG units in the training areas (James M. Montgomery, 1991). MMR is connected to the town of Mashpee water supply as a backup to Well J.

The water distribution system includes one 375,000-gallon elevated storage tank and one 400,000-gallon elevated storage tank. There is also a 500,000-gallon aboveground deluge tank for fire suppression in Building 158. The distribution system was constructed in the early 1940s and consists of cast iron mains ranging in size from 4 to 14 inches (James M. Montgomery, 1991).

Well J is generally operated twice each day to maintain storage in MMR water tanks. Typical daily pumping volumes are 400,000 to 500,000 gallons, extracted over a 4.5- to 5.5-hour period. However, pumping periods can be as long as 13 hours. Longer pumping periods may occur because of equipment failure, firefighting requirements, or short-term increases in base personnel. Average per capita water consumption is estimated to be 94 gallons per day (gpd) (James M. Montgomery, 1991). Water is withdrawn under a permit from the MADEP. Water is pumped from Well J at an average rate of 9 million gallons per month (gpm) based on data for FY 1994.

There are three water supply wells (Wells B, E, and G) on MMR which were also once part of the main MMR water supply system. Well B was taken out of service from the MMR drinking water supply system in 1962 because of high levels of phenolic compounds, but recent testing has shown phenol concentrations to be below detection limits and drinking water standards. Well B is currently used to irrigate the golf course. Well E, which is located near the NW runway, was taken out of service in 1959-60 when the NW/SE runway was constructed. Well G, in the USCG area of MMR, was taken out of service in November 1985.

The VA Cemetery, Cape Cod Air Station, the USCG Transmitter Station, and Textron are not connected to the Well J water supply distribution system. Each of these facilities maintains their own water supply wells.

Public Drinking Water Supply Wells. Each of the four towns that border MMR has developed drinking water supply wells and water distribution systems. Each town's public drinking supply wells are summarized in the following subsections. The Long Range Water Supply Study is currently testing 10 wells for the potential to provide future water sources (Stone and Webster, 1995).

Bourne. Bourne has three wells in operation. Most of the town is serviced with public water; the major exceptions are Scraggy Neck and Wings Neck. Bourne is currently in the process of developing future water supply wells.

Falmouth. Falmouth has two wells and one reservoir in operation, and several more wells planned for the future. Additional sites (Wells 1A through 1E) are being evaluated for use as public well sites; it is not currently known if they will be proposed as future water supply wells for the town. A large portion of the town is served by public water.

Mashpee. Mashpee began pumping its first public supply well in July 1990 and is investigating further well development. Public water supply is more limited in Mashpee than in the other towns surrounding MMR; however, plans are being made for extensions.

The High Wood Water Company is a private enterprise that supplies water to parts of Mashpee from three wells. Although the High Wood Water Company is separate from the Mashpee Water District, the service it provides is essentially a public water supply.

Sandwich. Sandwich has several public drinking water supply wells, most of which are located in the northern part of town. The water supply lines in Sandwich serve most of the town.

3.5.4.2 Solid Waste

Most solid waste generated at MMR is hauled to the Upper Cape Regional Transfer Station, located in the southern part of the cantonment area. This transfer station is partially owned and overseen by the town of Falmouth and receives solid waste from Falmouth, Mashpee, Sandwich, and MMR. Waste delivered to the transfer station is inspected, segregated, and loaded onto railcars for transfer to the SEMASS facility in Rochester, Massachusetts, where it is incinerated. The transfer station was activated on July 1, 1989 and has an estimated annual capacity of 40,000 tons. Peak daily and weekly usage of the transfer station typically occurs during July or August. Daily transfer amounts range from 120 to 275 tons. MMR contributes approximately 5.5 percent of the waste shipped from the transfer facility. Solid waste generated by MAARNG and USCG is hauled to the transfer station by privately contracted solid waste handlers. MAANG transfers its own solid waste to the transfer station using USAF personnel. The remaining occupants at MMR dispose of solid waste via subcontracted services with licensed solid waste haulers.

Prior to 1984, solid waste generated at MMR was landfilled at the main sanitary landfill located in the area bounded by Turpentine Road and Frank Perkins Road to the east and west, respectively, and Herbert Road and Connery Road to the north and south, respectively. The landfill no longer receives wastes and is being capped for closure.

3.5.4.3 Stormwater

The surficial geology of the Upper Cape consists primarily of glacial outwash sands which are highly permeable. Approximately 40 percent (18 to 21 inches) of the average annual precipitation (48 inches) infiltrates the subsurface and replenishes groundwater supplies (E.C. Jordan, 1989). Approximately half of the annual rainfall is lost through evaporation or through vegetation (evapo-transpiration). Rainfall which does not immediately infiltrate the soil often collects in kettle holes or depressions where it subsequently percolates to groundwater or evaporates. These processes essentially eliminate surface water runoff except on extreme slopes. Several intermittent streams are located in drainage swales within the cantonment area at MMR. These intermittent streams are fed by stormwater collection system outfalls and are active only during heavy rainfall.

Two major stormwater collection systems are present within the cantonment area at MMR. The layouts of these two storm drain systems (generally referred to as the western and eastern storm drainage systems) are described below. The western drainage system serves the Coast Guard Housing Complex surrounding Osborne and Edmunds Ponds in the western portion of the Cantonment Area. The eastern drainage system carries runoff from the runways and ramps. The eastern drainage system is more complex and incorporates three drainage ditches discharging to Ashumet and Johns Pond south of the MMR boundary, as well as two additional infiltration basins. Each of the five drainage ditches/basins within the eastern drainage system is discussed separately. The eastern drainage system serves the runway and aircraft support areas, and two of the three drainage ditches leading off the reservation are equipped with an oil/water separator to remove fuels or oils floating on the storm water runoff.

Rain events of 1 to 2 inches per hour are typically sufficient to cause flow in the drainage ditches flowing south off the reservation. Limited surface water flow occurs in the three drainage ditches (SD-1, SD-2, and SD-3; see below) leading to Ashumet and Johns Ponds. Sufficient rainfall to develop surface water discharge to Ashumet Pond occurs from one to four times per year on average. [The MAANG has a draft copy of the Stormwater Pollution Prevention Plan, August 1995, currently being reviewed by 102FW.]

Western Drainage System. The western storm drainage system conveys runoff primarily from the USCG housing area and shops to Osborne and Edmunds Ponds and other smaller depressions located in the housing area. Street and parking lot runoff are conveyed primarily to drainage outfalls around the two ponds where infiltration occurs.

Eastern Drainage System, SD-1. Drainage ditch SD-1 begins at an outfall located at the MMR boundary south of South Outer Road. The drainage channel, completed in 1960, is approximately 2,300 ft long, up to 40 ft wide, and 6 to 10 ft deep. The channel is constructed of riprap blocks and was recently dammed in three separate areas to better enable on-site recharge. The ditch conveys stormwater southward off base to the abandoned cranberry bogs located north of Ashumet Pond. The drainage ditch receives water at its northern end from one 48-inch and two 72-inch storm drains. The 48-inch line drains portions of the parade ground. During major rain events, the two 72-inch lines convey stormwater which overflows from the SD-5 drainage area (see SD-5, below).

Eastern Drainage System, SD-2. Drainage ditch (SD-2) begins at the terminus of two 42-inch storm drains and an oil/water separator located immediately south of South Outer Road. SD-2 extends approximately 2,500 ft south-southwest from the oil/water separator and discharges to Ashumet Pond. The storm sewer line discharging to SD-2 receives storm water runoff from the Petroleum Fuels Storage Area, aircraft maintenance ramp, and hangar nosedocks. SD-2 drains a surface area of approximately 6 million-sf including heavily developed areas along the flight line facilities. During major rain events, SD-2 leads to Ashumet Pond and is located approximately 300 ft east of the Cranberry Bog.

Eastern Drainage System, SD-3. The third drainage course drains the extreme eastern portion of the flight line and hangar area and flows into drainage system SD-4.

Eastern Drainage System, SD-4. Drainage area SD-4, Aircraft Maintenance Storm Drainage Ditch, is a drainage basin located on the northern and southern sides of Reilly Road. The drainage basin receives runoff from storm sewers that lead from Hangars 158, 128, 126, and 124, and the runway and ramps after stormwater runoff has passed through an oil/water separator. The majority of water entering the drainage basin percolates into the subsurface. During major rain events, water discharges to Johns Pond.

Eastern Drainage System, SD-5. Drainage area SD-5 is located less than 3,000 ft from the southern MMR boundary, between North Outer Road and Lingley Avenue, just west of Runway No. 5. The SD-5 drainage area receives runoff from the western portion of the former EC-121 parking and fueling area, the alert hangar area, and portions of the southern runway area. This stormwater runoff discharges to a central drainage swale within SD-5 where most of the storm water runoff infiltrates the subsurface. During heavy rain events, drainage basin SD-5 overflows into SD-1 (see above).

MAANG has instituted an initiative to evaluate the potential of all stormwater recharging on site. SD-1/SD-5 have already been blocked with rip rap berms to facilitate on-site recharging. Only extreme high water events would allow storm water to flow from SD-1/SD-5 off MMR. The SD-4 system is presently being evaluated to facilitate on-site recharge.

Cape Cod Air Station. At the Cape Cod Air Station, there are three storm water drainage systems and a fourth drain system for the 200,000-gallon potable water storage tank. The west side stormwater drain system receives effluent from an oil/water separator, which discharges through an outfall on the west side of the station. The SE side stormwater drain system receives blowdown from the cooling water system and discharges to the ground immediately under the cooling tower. The north side system also receives boiler blowdown. This system discharges on the north side of the station. A fourth outfall is located on the west side of the station and is the outfall for the 200,000-gallon potable water drain (James M. Montgomery, 1991).

Stormwater runoff from the remaining property at MMR percolates into the ground and is not contained by any engineered structures.

3.5.4.4 Electrical Energy

The Commonwealth Electric Company supplies electricity for all of MMR. FY 1994 electricity demands of MMR occupants is discussed as follows:

- MAANG maintains the electrical grid for MAARNG. During FY 1994, MAARNG consumed 1,727,087 kilowatt-hours (KWH) of electricity.
- The Reservation electric distribution system is a 4,160-volt system fed by a MAANG-owned substation. MAANG uses approximately 9,300,000 KWH of electricity annually. MAANG is responsible for the distribution system operation and maintenance.
- Electricity for Cape Cod Air Station is supplied from two feed lines from Commonwealth Electric. The feed lines enter a substation which reduces the incoming voltage from 115 kVA to 22 kVA. The Cape Cod Air Station power requirement (standing load) is relatively constant at approximately 2 megawatts. Five 1.5-megawatt diesel-fired generators provide backup electrical power for the facility.
- Electricity for USCG is supplied by Commonwealth Electric through MAANG. The USCG uses approximately 9,528,568 KWH annually. The USCG transmitter station uses approximately 706,728 KWHs annually.
- Electricity for the USDA is supplied by Commonwealth Electric through a MAANG feed. Annual electric consumption is approximately 744,000 KWHs.

3.5.4.5 Natural Gas

Natural gas is supplied by Colonial Gas to various occupants at MMR. FY 1994 natural gas demand of MMR occupants is discussed below:

- Natural gas for MAARNG is used primarily to fuel boilers heating the buildings. MAARNG consumed approximately 385,868 cubic feet (cf) of natural gas in 1994. MAARNG also used 634 gallons of propane gas in 1994.
- Natural gas for MAANG is used primarily to fire the boilers used to heat the buildings. MAANG consumed approximately 765,000 cf of natural gas during FY 1994.
- The Cape Cod Air Station does not have a natural gas connection. The facility does maintain a 1,000-gallon propane tank which supplies fuel for heaters to deice the satellite equipment during the winter. Propane is ordered as needed, and the facility typically uses less than 500 gallons annually.
- The Textron facility does not have a natural gas connection.
- Natural gas for the VA is supplied by Colonial Gas and is primarily used to heat the buildings. The VA converted from heat pumps to natural gas heating approximately one year ago, but maintains the heat pumps for air conditioning.
- The USCG uses approximately 1,623,067 cf of natural gas annually. The USCG Transmitter Stations use approximately 21,000 cf of natural gas annually.
- Natural gas for USDA is supplied by Colonial Gas and is primarily used to generate steam to heat the buildings. Monthly natural gas consumption is approximately 49,200 cf.

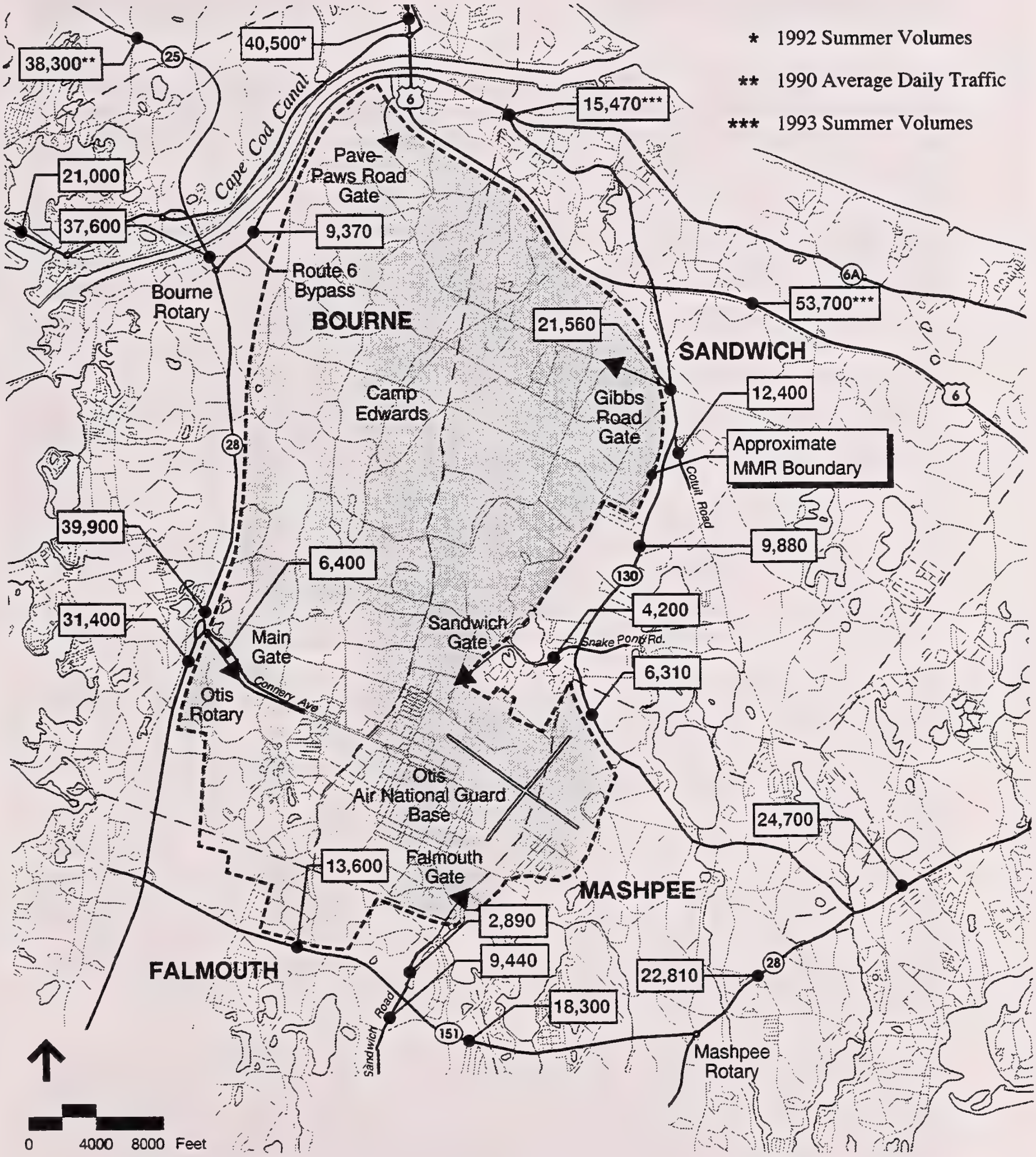
3.5.5 Transportation

This section discusses the existing transportation system serving MMR and the adjacent communities of Bourne, Falmouth, Sandwich and Mashpee.

3.5.5.1 Existing Transportation Infrastructure

Existing transportation conditions presented in this section consists of an inventory of roadway and intersections within the vicinity of MMR, the collection of daily and peak hour traffic volumes, and analysis of roadway and intersection level of service (LOS). A review of recent accident history is presented in Appendix I.

Direct access to MMR is provided through several entrances as shown on Figure 3-13. The main gate entrance is located on Connery Avenue, just east of the Otis rotary on Route 28 in Bourne. The Falmouth gate entrance is located off Sandwich Road near the Falmouth/Mashpee town line. The Sandwich gate entrance is located off Snake Pond Road to the west of Route 130. The PAVE-PAWS Road entrance is located off the Route 6 Bypass, across from Factory Outlet Road. A limited access gate that is used for convoys only is located on Gibbs Road off Route 130 in Sandwich.



Sources: VHB August 1995 Counts

Cape Cod Traffic Counting Report 1994

1994 Traffic Report Volumes for the Commonwealth of Massachusetts

1995 SUMMER
DAILY TRAFFIC VOLUMES

File Name:

Figure 3-13

Regional/Local Access. Regional access to MMR is somewhat limited because it is located on the Cape Cod peninsula bordered by Cape Cod Bay to the north, and Buzzards Bay and Nantucket Sound to the south. Infrastructure providing regional access to MMR consists of several principal arterials.

Route 3 connects with Route 6 just north of the Sagamore Bridge, and provides access to MMR from points north of the Cape Cod Canal, such as Boston. Route I-495 to Route 25 provides access to MMR from points NW of the Cape Cod Canal. From points west of Buzzards Bay, such as Providence, Rhode Island, and New York City, Route I-195 to Route 25 is the major access route. Route 6 provides primary access to MMR from all points east, extending to Provincetown on the tip of the Cape Cod peninsula.

The principle roadways which surround MMR are (see Figure 3-13):

- Route 28 (Bourne), from the Bourne rotary to Route 151;
- Route 6 Bypass (Bourne/Sandwich), from the Bourne rotary to Route 130;
- Route 130 (Sandwich/Mashpee), from Route 6 to Route 28;
- Route 28 (Mashpee), from Route 130 to Route 151;
- Route 151 (Falmouth/Mashpee), from Route 28 (Mashpee) to Route 28 (Bourne).

Local access to MMR is provided by arterials and collector roads which lead directly to an entrance (see Figure 3-13).

3.5.5.2 Existing Transportation Conditions

Vehicle Traffic. Daily traffic volumes on roadways providing regional and local access to various locations on Cape Cod are highly variable depending on the season (see Figure 3-13). As might be expected for Cape Cod, summer volumes are generally about 25 percent higher than average yearly volumes and almost 80 percent higher than the lowest volumes in mid-winter. Summer traffic on the roadways providing regional and local access to various locations on Cape Cod are summarized in Appendix I.

Local traffic volumes were counted both mechanically and manually at key locations throughout the study area in August 1995. Automatic traffic recorder counts were taken at the following locations: on Route 28 just north and south of the Otis rotary; at the Main gate on Connery Avenue; at Lake Drive Extension to the west of the Otis rotary; at Snake Pond Road off Route 130 at the Sandwich Gate; and at PAVE-PAWS Road off the Route 6 Bypass. The Automatic traffic recorders were active from Wednesday, August 23 to Monday, August 28, 1995. Additionally, peak period turning movement counts were conducted at the Main Drive rotary from 7:00 to 9:00 AM, and from 4:00 to 6:00 PM on Wednesday, August 23, 1995. The observed traffic volumes are summarized in Appendix I.

Traffic demand generated specifically by MMR was determined by observing gate activity on a typical summer day. Table 3-20 summarizes the traffic demand generated at each gate. MMR generates approximately 6,900 vehicle-trips entering and exiting the installation on a summer weekday. This reflects the total traffic observed at all gates currently used. For weekday traffic about 8 to 15 percent of the daily demand at these entrances occurs during the morning and evening peak hours, generally beginning at 7:00 AM and 4:00 PM, respectively. On Saturdays, about 8 to 13 percent of the daily demand occurs during the midday, generally from 10:00 AM to 3:00 PM.

Table 3-20
MMR 1995 Daily Summer Traffic Volumes

Gate	Inbound Volume	Outbound Volume	Total Volume	Percent of Total
Main Gate	3,220	3,230	6,450	47
Sandwich Gate	2,030	2,190	4,220	31
Falmouth Gate	1,490	1,400	2,890	20
PAVE-PAWS Gate	120	115	235	2
Total	**6,860**	**6,935**	**13,795**	**100**

Source: VHB, Inc., August 23-28, 1995

Traffic Operations. Traffic operations at adjacent roadways and key intersections in the study area were analyzed during periods of critical demand in order to identify any existing operational deficiencies. Historical traffic count data from the Cape Cod Commission and the Massachusetts Highway Department indicate that summer volumes are about 40 percent greater than average yearly volumes for roadways in the study area. Therefore, all volumes used in the analyses reflect summer conditions.

The following assumptions regarding arrival time, mode, and avenue of approach were made in determining existing traffic conditions:

- For utilization by various military components, approximately 67 percent of the soldiers using Camp Edwards for training are Reserve or National Guard soldiers on IDT over the weekend, and approximately 33 percent are active duty soldiers and Reserve or National Guard soldiers on AT during the weekday. This breakdown was derived from the utilization data for FY 1994.
- Approximately 80 percent of the Reserve or National Guard soldiers training at Camp Edwards are from Massachusetts. The remaining 20 percent are from various neighboring states. This breakdown was derived from the utilization data for FY 1994.

- All soldiers (in-state and out-of-state) arriving by convoy access the Training Area via the Gibbs Road Gate off Route 130. All soldiers arriving by POV utilize the Main Gate off Connery Avenue, east of the Otis Rotary. Each convoy vehicle accommodates two soldiers. This is a very conservative estimate considering that at least two soldiers (driver and assistant driver) are required in each vehicle in a convoy for safety purposes.
- In-state and out-of-state soldiers on AT arrive mainly between 6:00 AM and 9:00 AM on Saturday. None are expected to arrive during the mid-day peak hour. Of the in-state soldiers, 75 percent arrive by convoy and 25 percent arrive by POV. All out-of-state soldiers on AT arrive via convoy. The peak hour accounts for about 40 percent of the total AT soldiers arriving over this time interval.
- In-state and out-of-state soldiers on IDT arrive mainly from 6:00 PM to 10:00 PM on Friday. None are expected to arrive during the Friday evening peak hour. Of the in-state soldiers, 75 percent arrive via convoy and 25 percent arrive via POV. All out-of-state soldiers on IDT arrive via convoy. The peak hour accounts for about 30 percent of the total IDT soldiers arriving over this time interval.
- Active duty soldiers (in-state and out-of-state) arrive via convoy from 6:00 AM to 9:00 AM on Saturday. The peak hour accounts for about 40 percent of the total soldiers arriving over this time interval.
- All civilians utilizing the Training Area arrive from 6:00 to 9:00 AM Saturday via POV through the Main Gate off Connery Avenue.
- The maximum monthly utilization will occur in June which will experience about 25 percent of the annual utilization (FY 1994 data).
- The maximum weekly utilization is about 35 percent of the monthly utilization.

Roadway Segments. The capacity of the various study area roadway types was established using the highway capacity analysis methodology described in Chapters 7 and 8 of the Highway Capacity Manual (1985). The capacities for each roadway class were based on general characteristics including number of lanes, roadway and shoulder width, and traffic composition. The peak hour volume-to-capacity (v/c) ratio was calculated to evaluate the capacity status of roadway segments. A segment is considered to be "under capacity" if the peak hour volume is less than 80 percent of capacity, "near capacity" if the volume is between 80 to 90 percent of capacity, and "at capacity" if volume is over 90 percent of capacity. Segments which are at or near capacity are considered to be deficient.

The analysis included the following key roadway links:

- Route 28, between the Bourne rotary and the Bourne/Falmouth town line;
- Route 151, between Route 28 in Falmouth and Route 28 in Mashpee;
- Route 28, between the Mashpee rotary and Route 130; and
- Route 130, between Route 28 and Route 6

Route 6 was not analyzed because it is a limited access highway which does not provide direct access to a gated entrance to MMR. Similarly, the Route 6 Bypass was not analyzed because the Cape Cod Air Station entrance, located adjacent to the Route 6 Bypass, is only used by approximately two percent of vehicles entering or exiting MMR. Table 3-21 summarizes the existing operation of these roadway links. The links which operate near capacity during one or both peak hours include Route 130 (north of Cotuit Road), Route 28 (west of Route 130), and Route 151 (east of Sandwich Road).

Table 3-21
Roadway Link Summary

Location	Period	Capacity*	1995 Existing (Summer)		
			Volume**	V/C+	Status
Route 28, North of Otis Rotary	Evening	4,500	3,210	0.71	Under Capacity
	Saturday	4,500	3,360	0.75	Under Capacity
Route 28, South of Otis Rotary	Evening	4,500	2,440	0.54	Under Capacity
	Saturday	4,500	2,670	0.59	Under Capacity
Route 151, East of Sandwich Road	Evening	2,250	1,575	0.70	Under Capacity
	Saturday	2,250	1,810	0.80	Near Capacity
Route 151, West of Sandwich Road	Evening	2,250	1,085	0.48	Under Capacity
	Saturday	2,250	1,250	0.56	Under Capacity
Route 28, West of Route 130	Evening	2,250	1,810	0.80	Near Capacity
	Saturday	2,250	2,250	1.00	At Capacity
Route 130, North of Cotuit Road	Evening	2,250	1,880	0.84	Near Capacity
	Saturday	2,250	1,970	0.88	Near Capacity
Route 130, Between Cotuit/Snake Pond Road	Evening	2,250	1,060	0.47	Under Capacity
	Saturday	2,250	1,270	0.56	Under Capacity
Route 130, Between Cotuit/Route 28	Evening	2,250	750	0.33	Under Capacity
	Saturday	2,250	900	0.40	Under Capacity

Notes:

* Estimated based on Highway Capacity Manual Procedures
** Vehicles per hour.
+ Volume-to-capacity ratio

Source: VHB, Inc., August 23-28, 1995

Intersections. In addition to the link analysis, the following key intersections were analyzed:

- The Bourne rotary;
- The Otis rotary;
- Route 151 (Nathan Ellis Highway) at Sandwich Road (unsignalized);
- Route 28 at Route 130 (signalized);
- Route 130 at Snake Pond Road (unsignalized); and
- Route 130 at Cotuit Road (unsignalized)

The 1995 existing evening and Saturday peak hour turning movement volumes are summarized in Figures 3-14 and 3-15, respectively, for these key intersections. The base for evaluating the LOS for signalized intersections, traffic rotaries and unsignalized intersections is described below. An overall summary of the existing LOS for key unsignalized intersections, traffic rotaries, and signalized intersections is provided in Table 3-22.

Table 3-22
Intersection Summary

Location	Period	1995 Existing Summer		
		Volume *	ARC **	LOS ***
Unsignalized				
Route 151 at Sandwich Road	Evening	402	^	F
	Saturday	442	^	F
Route 130 at Snake Pond Road	Evening	168	^	F
	Saturday	172	^	F
Route 130 at Cotuit Road	Evening	539	175	D
	Saturday	548	63	E
Rotaries			**V/C^^**	**LOS ^^^**
Otis Rotary	Evening	1.999	0.65	B
	Saturday	2,036	0.67	B
Bourne Rotary	Evening	2.274	0.89	D
	Saturday	2.502	0.98	E
Signalized			**Delay +**	**LOS ++**
Route 28 at Route 130	Evening	759	^	F
	Saturday	1,025	^	F

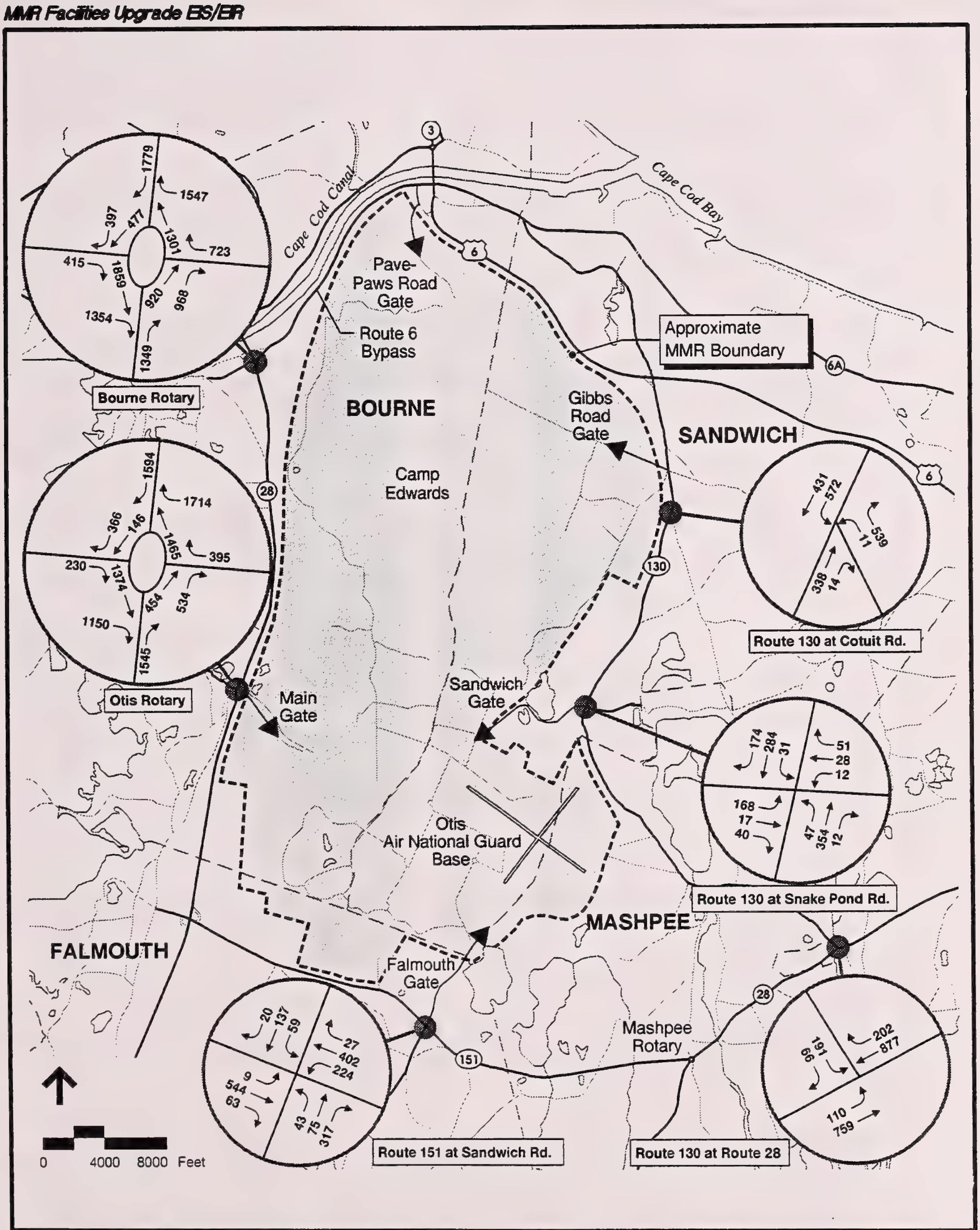
Notes:

* Vehicles per hour, for critical movements.
** Available reserve capacity (ARC) in vehicles per hour, for critical movement.
*** Level of service (LOS) for critical movement at intersection
B Short traffic delays (see Appendix I)
D Long traffic delays (see Appendix I)
E Very long traffic delays (see Appendix I)
F Extremely long traffic delays (see Appendix I)

^ When demand volume exceeds the capacity of the lane, extreme delays will be encountered with queuing.

^^ Average volume-to-capacity ratio for weaving sections of rotary.
^^^ LOS for critical weaving section.
+ Overall Average peak hour delay per vehicle in seconds.
++ LOS for intersection as a whole.

Source: VHB, Inc.



Sources: VHB August 1995 Counts

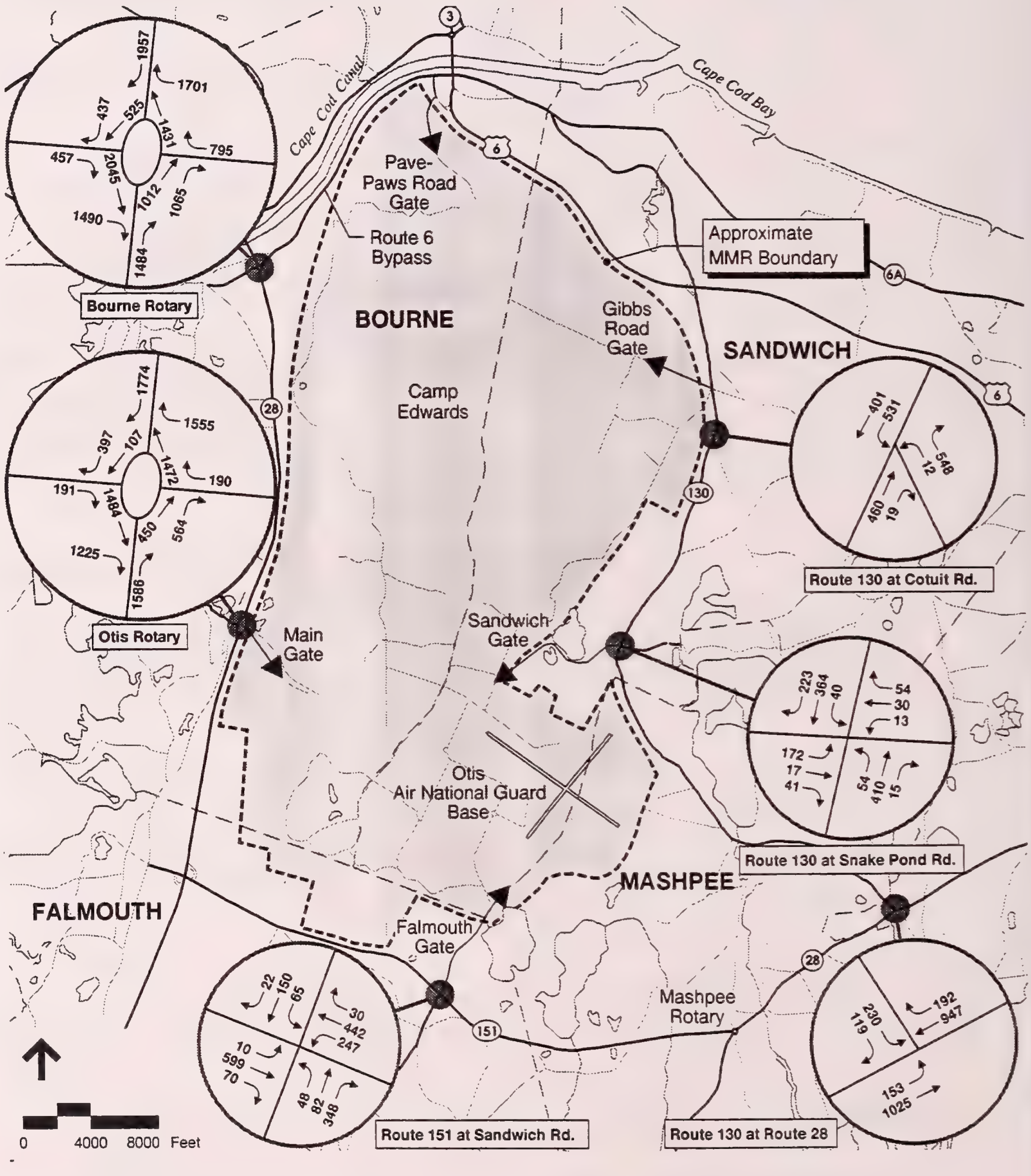
Cape Cod Traffic Counting Report 1994

1994 Traffic Report Volumes for the Commonwealth of Massachusetts

1995 EXISTING EVENING PEAK HOUR TRAFFIC VOLUMES

File Name:

Figure 3-14



Sources: VHB August 1995 Counts

Cape Cod Traffic Counting Report 1994

1994 Traffic Report Volumes for the Commonwealth of Massachusetts

1995 EXISTING SATURDAY MIDDAY PEAK HOUR TRAFFIC VOLUMES

File Name:

Figure 3-15

The existing signalized intersection of Route 28 at Route 130 operates at LOS F in both the evening and Saturday midday peak hours. This is principally due to left-turning vehicles blocking the flow of through vehicles on the Route 28 eastbound approach which has only one approach lane.

Two of the three unsignalized intersections operate at LOS F in both peak periods. All moves from the Sandwich Road approaches to Route 151 operate at LOS F because heavy traffic flow on Route 151 makes it difficult for side street traffic to cross or turn into the main street flow. Similarly, left turns from the Snake Pond Road approaches to Route 130 operates at LOS D during the evening peak hour and LOS E during the Saturday midday peak hour.

All sections of the Otis Rotary operate at an acceptable LOS during both peak hours and all sections of the Bourne Rotary operate at an acceptable LOS during the evening peak hour. During the Saturday midday peak hour, two sections of the Bourne Rotary operate at LOS E because of the heavy southbound flow on Route 28.

3.6 Socioeconomic Environment

This section describes the existing economic conditions at MMR. Surrounding Communities, Population and Demographics, Employment Structure and Profile, the Regional Economy, and Environmental Justice are discussed below.

3.6.1 Population And Demographic Conditions

3.6.1.1 MMR Population

The population of MMR varies with the time of year and day of the week. The population increases during the summer months, both weekday and weekends, according to National Guard training schedules. Approximately 90 percent of the personnel that work or are stationed full-time at MMR live outside the installation. The remaining personnel live in the cantonment area, which houses 526 personnel and their families, totaling approximately 2,500 people. Of the personnel, 179 are USCG personnel assigned to MMR, 324 are USCG personnel assigned to other units, and 23 are USMC personnel.

3.6.1.2 Surrounding Population

MMR is located in Barnstable County, within or bordering the towns of Bourne, Falmouth, Sandwich and Mashpee. The U.S. Census Bureau estimated Barnstable County's 1994 population at 196,178, a 5.13 percent increase over the 1990 population of 186,605. During this time period, Bourne grew 3.62 percent, Falmouth 3.54 percent, Sandwich 14.63 percent, and Mashpee 21.00 percent. Population figures for 1980, 1990 and estimates for 1994 are shown in Table 3-23. As a seasonal destination, the population in Barnstable County varies throughout the year. The Cape Cod Commission estimated that the 1990 population nearly tripled from a winter low of 186,605 to a summer peak of 536,100.

Table 3-23
Local Population Data (1980, 1990, and 1994)

Municipality	Population					Density
	1980	1990	% Change 1980-1990	1994 (Est.)	% Change 1990-1994	1990 (people per sq. mi.)
Massachusetts	5,737,037	6,016,425	5%	6,041,123	.41%	767.6
Barnstable County	147,925	186,605	26%	196,178	5.13%	471.5
Bourne	13,874	16,064	16%	16,646	3.62%	392.8
Sandwich	8,727	15,489	77%	17,755	14.63%	360.2
Falmouth	23,640	27,960	18%	28,949	3.54%	631.2
Mashpee	3,700	7,884	113%	9,540	21.00%	335.5

Source: U.S. Census of Population, 1980, 1990; U.S. Census Bureau population estimates, 1994

Barnstable County had the fastest growing population of all the 14 Massachusetts counties between 1920 and 1990 and the second fastest growth rate between 1980 and 1990. The county experienced growth of 26 percent between 1980 and 1990, compared to 5 percent growth rate for all of Massachusetts during the same period.

A notable trend is the recent dramatic population growth of Mashpee which borders MMR to the SE. The population in Mashpee more than doubled between 1980 and 1990, from 3,700 to 7,884 people. This was the highest percentage increase over that decade for any town in Massachusetts.

The average population densities in Barnstable County are considerably lower that the state average of 767.6 people per square mile. The county as a whole has a density of 471.5 people per square mile. Falmouth has the highest density of MMR's four neighboring towns at 631.2 people per square mile, although much of this population is concentrated along the coast. Bourne, Sandwich and Mashpee all have densities below 400 people per square mile.

3.6.1.3 Environmental Justice

On February 11, 1994, President Clinton issued EO 12898, Federal Action to Address Environmental Justice in Minority and Low-Income Populations. The purpose of the order is to ensure that any adverse environmental, economic, social, or health impacts resulting from federal actions and policies are not placed disproportionately on minority and low-income populations. The President directed USEPA to ensure that agencies analyze environmental effects on minority and low-income communities, including human health, social, and economic effects. Table 3-24 presents the racial characteristics of the community populations surrounding MMR.

1990 US Census data was reviewed to determine where, if any, minority or low-income populations were located in the vicinity if MMR. Barnstable County has a relatively small minority population. In 1990, the minority population of the county was 4.6 percent of the total population compared to 12.2 percent for the state as a whole. Of the four towns surrounding MMR, the highest percentage minority population was 11.8 percent (Mashpee). Of the minority populations in the four towns surrounding MMR, the closest populations to MMR are located in four Census block groups in Mashpee, east southeast of Otis ANGB. The caucasian (majority) population in these block groups ranges between 83 and 86 percent of total population. This is much lower than the 95 percent average for Barnstable County, but is more consistent with the 88 percent average for the state. The minority populations in these block groups are primarily comprised of African Americans and Native Americans. Persons of hispanic origin and a small Asian population represent the balance of the minority population. There are no other concentrations of minority population immediately surrounding MMR.

The poverty rate in Barnstable County is slightly lower than the state as whole. Approximately 7.5 percent of the Barnstable County population live under the federally-defined poverty level compared to 8.9 percent for the state as a whole. All four towns surrounding MMR have a lower proportion of people living in poverty than the state as a whole. In addition, Bourne (6.7 percent), Mashpee (7.4 percent) and Sandwich (4.8 percent) each have a lower poverty rate than Barnstable County. The poverty rate in Falmouth (8.6 percent) is slightly higher than the Barnstable County average, but lower than the state average.

Two Census block groups adjacent to MMR have a higher proportion of their population living below the poverty level than that of the state. One block group, southeast of MMR, has a poverty rate of 10.5 percent and also has a higher than average percentage of minority residents as discussed above. The other block group, located northwest of MMR along the Cape Cod Canal, has a poverty rate of 12.5 percent, although most of the inhabited portion of this block is west of Route 28 and does not immediately border MMR.

3.6.2 Employment Structure And Profile

Installation Employment. MMR is used primarily as a training site for MAARNG and MAANG personnel. In general, the personnel who use MMR can be divided into four groups 1) full-time personnel permanently assigned, 2) part-time personnel assigned to organizations who are permanent MMR occupants, 3) transient military personnel who train at MMR, and 4) transient civilian personnel who train at MMR (see Table 3-1).

Table 3-24
Race Characteristics of Surrounding Population, 1990

Racial Category	Barnstable County		Bourne		Falmouth		Mashpee		Sandwich	
	Persons	Percent	Persons	Percent	Persons	Percent	Persons	Percent	Persons	Percent
White	179,551	96.2%	15,507	96.5%	26,438	94.5%	7,020	89.0%	15,239	98.4%
African American	2,827	1.5%	226	1.4%	497	1.8%	312	4.0%	65	0.4%
Native American	1,180	0.6%	86	0.5%	176	0.6%	385	4.9%	50	0.3%
Asian	968	0.5%	97	0.6%	198	0.7%	29	0.4%	81	0.5%
Other	2,079	1.1%	148	0.9%	651	2.3%	138	1.8%	54	0.3%
TOTAL POPULATION	186,605	100.0%	16,064	100.0%	27,960	100.0%	7,884	100.0%	15,489	100.0%
Hispanic Origin*	2,287	1.2%	200	1.2%	411	1.5%	116	1.5%	131	0.8%

Source: US Census 1990

Note: Percentages may not equal 100% due to rounding

* Hispanic Origin is an ethnic rather than racial category. Persons of Hispanic origin can be of any race.

Local Employment. According to Massachusetts Department of Employment and Training data, public and private-sector employment in Barnstable County averaged 72,371 in 1994, an increase of 4 percent from 69,702 in 1993. The unemployment rate for 1994 was 8.3 percent, compared with a statewide rate of 6.0 percent. Unemployment on the Cape varies dramatically by season. For instance, in 1994 the unemployment rate was at a low of 5.1 percent at the peak of the summer season in August 1994, and at a winter high of 14.2 percent in January 1994.

As shown by the following list of top 10 industry employers for 1994, employment on Cape Cod is largely driven by the seasonal and retired population of the region.

1) Eating and Drinking Places (13%)
2) Local Government (11%)
3) Grocery Stores (5%)
4) Hotels and Motels (5%)
5) Nursing and Personal Care Facilities (4%)
6) Hospitals (3%)
7) Home Health Care (3%)
8) Miscellaneous Shopping Goods Stores (3%)
9) Federal Government (2%)
10) Research and Testing Services (2%)

The median household income of Barnstable County residents in 1989 was $31,766 which was 86 percent of the state's average income of $36,952. The four neighboring towns of MMR all have higher median household incomes than the county as a whole. Ranked against all 15 towns in Barnstable County in terms of median household income, Sandwich ranks first ($43,500), Bourne ranks third ($34,159), Falmouth ranks fourth ($33,944), and Mashpee ranks sixth ($32,524).

3.6.3 Regional Economy

Status and Trends. The Cape Cod economy is dependent on a large influx of seasonal residents and a large number of permanent residents who have retired to the area. Trade and services are the main source of employment in the region, although the economy is shifting from a seasonal tourist-fishing-agriculture base to a more diversified year-round base. Between 1980 and 1991, year-round jobs increased from 66 percent to 75 percent of total jobs.

The economic base of any community is defined as those goods and services sold outside the region or to buyers who earned their income outside the region. According to the Cape Cod Commission, the economic base of Cape Cod is $1.6 billion and is composed of tourists and seasonal residents (44 percent), retirees (15 percent), business services (11 percent), commuters (7 percent), manufacturing (6 percent), marine industries (5 percent), defense industries (5 percent), and miscellaneous sources (7 percent). Full-time Cape Cod residents spent an additional $1 billion.

The U.S. Census reports that retail sales in Barnstable County grew from $1.2 billion in 1982 to $2.1 billion in 1992, increasing the county's share of total Massachusetts sales from 4.1 percent to 4.5 percent. All retail categories, except general merchandise stores, have seen significant growth in sales. During the same period, service industry revenues in the county increased from $306,513 to $762,207, an increase of 150 percent over 10 years and an average annual increase of 15 percent. Of the service industry categories, health services have seen the fastest growth, increasing sales by 60 percent between 1987 and 1992, compared to 36 percent for all categories.

Economic and Fiscal Contributions of MMR. Although no consolidated analysis has been conducted to date to assess MMR's contribution to the local economy, some occupants have estimated their own spending patterns. Of the 1,435 Otis ANGB personnel who represent over 50 percent of the MMR personnel estimate, 793 personnel live in Barnstable County. Otis ANGB annually spends more than $30 million on payroll, of which $21.8 million is spent in the local communities. In addition, with construction projects and local expenditures, it is estimated that $32 million is spent in the local economy annually, creating an estimated 540 additional jobs throughout the local communities.

Because this represents only the contribution of Otis ANGB, actual economic benefits to the community are much higher. Otis ANGB represents about 50 percent of the total employment on MMR, it would follow that Otis ANGB represents approximately 50 percent of the total MMR spending in the community. According to this logic, extrapolating the results of the Otis ANGB economic impact analysis yields total local MMR expenditures of $64 million, or about 2 percent of the expenditures from all sources (about $2.6 billion).

In addition, MMR contributes various facilities and services that provide fiscal benefits to local municipalities. The mutual aid agreements between MMR and the neighboring towns provide communities with additional fire fighting and emergency services that would be very expensive (such as hazardous waste spill response equipment and personnel). Finally, three of the neighboring communities (Sandwich, Mashpee, and Falmouth) share the SEMASS solid waste transfer station located on MMR which saves community expenditures for solid waste disposal.

4.0 ENVIRONMENTAL CONSEQUENCES

This section describes the potential environmental consequences that may result from the construction and operation of the proposed projects. Mitigative measures are identified where necessary to reduce or eliminate potential adverse impacts. This information is presented in a summary format for each of the Range Project scenarios and the alternative locations for each of the Cantonment projects. Potential impacts which may result from the construction, operation, and utilization of the proposed projects are summarized in this section with supporting detail presented in tables, figures, and appendices. The projected utilization of MMR for FY 2000 is presented in Table 4-1. FY 2000 represents the initial year of operation for all Range and Cantonment Projects.

Existing environmental conditions for individual project alternative locations are presented in this section to supplement the overview provided in Section 3.0 of this report. The following resources: climate; water resources; land use; transportation; and socioeconomics do not lend themselves to a site-specific discussion of existing conditions at the individual project alternative locations. In these instances, refer to Section 3.0 for descriptions of existing conditions. The existing conditions for air quality, noise, earth resources, biological resources, archeological resources, hazardous materials and hazardous waste management, and utilities at each of the project alternative locations is included in this section.

As described previously in Section 2.0, the preferred alternative for the Range Projects is Scenario 1; for the Cantonment projects it is Alternative 1.

4.1 Air Quality

Existing emissions sources, potential impacts, and mitigation at the project alternative locations are described below. Potential indirect (mobile source) emissions are presented in Section 4.12.1.4 and Appendix E. For a summary description of the air quality environment at MMR, see Section 3.3.2. Based on the amount of baseline emissions presented in Section 3.3.2, and the estimated project-related emissions presented in this section, ambient air quality monitoring of criteria pollutants does not appear warranted.

4.1.1 Range Projects

Sources of air pollutants from the Range Projects are primarily due to the firing of small arms. Small arms, and mortar and artillery rounds projected to be fired in FY 2000 at Camp Edwards (existing ranges and proposed project locations) are shown in Tables 4-2 and 4-3, respectively. Although mortar and artillery firing is not associated with the five Range Projects, their projected use and associated emissions are included to provide cumulative effects (see Table 4-3 and Section 4.12). In addition, range construction will

Table 4-1
Projected FY 2000 Utilization (Man-Days)

	Oct. 1999	Nov. 1999	Dec. 1999	Jan. 2000	Feb. 2000	Mar. 2000	Apr. 2000	May 2000	Jun. 2000	Jul. 2000	Aug. 2000	Sept. 2000	Annual Utilization
Full-Time Support													
Camp Edwards	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	3,620	43,440
Other Occupants	800	800	800	800	800	800	800	800	800	800	800	800	9,600
Total	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**4,420**	**53,040**
Training Units													
MAARNG	11,190	8,482	3,033	4,362	3,800	9,832	10,519	9,197	39,611	14,584	5,759	8,584	128,955
Other ARNG	972	0	0	27	4	1,090	2,652	1,083	2,683	18,689	7,444	4,411	39,054
USAF	144	590	81	66	61	927	1,231	272	2	14	226	700	4,314
MAANG	36	36	36	36	36	36	36	36	36	36	36	36	432
Other Res. Comp.	157	176	1,158	86	212	283	401	39	302	17	150	446	3,427
Active Army	16	9	26	0	1	1	31	4	16	21	13	6	144
Military Total	**12,515**	**9,293**	**4,334**	**4,577**	**4,114**	**12,169**	**14,870**	**10,631**	**42,650**	**33,361**	**13,628**	**14,183**	**176,326**
Civilian Law Enf.	2,380	402	88	118	30	132	1,230	1,272	422	0	84	534	6,692
Other Civilian	264	541	106	16	34	159	20	90	179	2,532	2,140	222	6,303
Civilian Total	**2,644**	**943**	**194**	**134**	**64**	**291**	**1,250**	**1,362**	**601**	**2,532**	**2,224**	**756**	**12,995**
Total Training	**15,159**	**10,236**	**4,528**	**4,711**	**4,178**	**12,460**	**16,120**	**11,993**	**43,251**	**35,893**	**15,852**	**14,939**	**189,321**
Total Utilization	**19,579**	**14,656**	**8,948**	**9,131**	**8,598**	**16,880**	**20,540**	**16,413**	**47,671**	**40,313**	**20,272**	**19,359**	**242,361**

Source: Camp Edwards, 1996.

Table 4-2
Projected FY 2000 Small Arms Firing at Camp Edwards

Range	Ammunition Type	Oct. 1999	Nov. 1999	Dec. 1999	Jan. 2000	Feb. 2000	Mar. 2000	Apr. 2000	May 2000	Jun. 2000	July 2000	Aug. 2000	Sept. 2000	Totals
MILITARY AND CIVILIAN WEAPONS FIRING														
A	.50 Cal	9713	4364	0	2684	2684	0	22830	5360	0	16917	6701	0	71253
B	5.56 MM	55880	31164	0	0	0	57383	19948	8526	3532	1014	0	10325	187772
	9 MM	548	0	0	0	0	0	1017	0	0	0	0	0	1565
C	5.56 MM	57855	16352	7662	0	0	58766	18454	21923	26026	6494	1806	8339	223677
	9 MM	0	0	0	0	0	0	0	0	0	80	0	10	90
D	5.56 MM MG	2926	12384	0	0	0	4014	5756	885	2994	3750	3206	0	35915
	7.62 MM	11853	50170	0	0	0	16264	23321	3584	12129	15194	12989	0	145504
E	9 MM	746	260	1369	0	1985	1128	312	507	253	479	233	267	7539
	.38 Pistol	846	0	0	0	0	0	250	0	535	1200	0	1150	3981
	.40 Pistol	0	0	0	0	0	0	0	0	240	0	0	0	240
	12 GA SG	0	0	0	0	0	0	0	0	0	400	0	0	400
G	5.56 MM MG	9371	1168	164	5613	0	0	0	9860	10746	0	0	1187	38109
	7.62 MM	8816	0	0	21226	0	0	0	0	28393	0	0	0	58435
	.380 Pistol	280	280	0	0	0	0	120	1300	0	0	0	240	2220
	.38 Pistol	0	0	0	0	0	0	100	0	150	0	0	0	250
	.40 Pistol	0	0	0	0	0	0	0	0	240	0	0	0	240
	12 GA SG	470	100	0	0	0	0	85	750	120	0	0	230	1755
H	5.56 MM	38266	5167	0	3294	0	0	0	3130	9928	0	2897	12071	74753
	7.62 MM	0	2194	0	0	0	0	0	12680	1100	0	0	48902	64876
	9 MM	493	137	0	0	0	0	356	0	137	0	821	0	1944

Table 4-2 (Continued)
Projected FY 2000 Small Arms Firing at Camp Edwards

Range	Ammunition Type	Oct. 1999	Nov. 1999	Dec. 1999	Jan. 2000	Feb. 2000	Mar. 2000	Apr. 2000	May 2000	Jun. 2000	July 2000	Aug. 2000	Sept. 2000	Totals
MILITARY AND CIVILIAN WEAPONS FIRING														
I	5.56 MM	23853	1261	0	0	0	12941	5618	1885	187	0	0	1682	47427
	9 MM	3518	164	356	411	0	1024	6609	890	452	0	951	0	14375
	.357 Pistol	0	700	1800	1100	0	0	0	0	0	0	0	0	3600
	.38 Pistol	0	300	0	1100	0	1100	3100	3100	1900	0	0	3000	13600
	12 GA SG	800	300	640	340	0	310	2180	610	500	0	0	0	5680
J	5.56 MM	0	0	0	0	0	0	0	2570	1647	0	0	0	4217
	9 MM	986	0	41	0	0	0	151	335	226	1246	342	342	3669
	.38 Pistol	6450	0	0	0	0	2188	17874	0	6100	30	0	450	33092
	.40 Pistol	0	0	0	0	0	0	0	0	0	0	0	200	200
	12 GA SG	995	0	0	0	0	80	970	0	0	1400	250	480	4175
K	5.56 MM	0	0	0	0	2943	2873	4906	0	0	4882	0	4865	20469
	9 MM	0	0	0	0	287	609	1791	760	438	329	561	479	5254
	.22 Pistol	0	0	0	0	3000	2200	0	0	0	2000	0	18	7218
	.38 Pistol	0	0	0	0	0	0	0	0	2620	0	0	0	2620
	.357 Pistol	0	0	0	0	0	0	930	0	0	0	0	0	930
	.380 Pistol	0	0	0	0	0	0	155	0	0	0	0	0	155
	.40 Pistol	0	0	0	0	0	0	135	0	0	0	0	0	135
	.223 AR 15 Rifle	0	0	0	0	0	200	0	0	0	0	0	0	200
	9 MM SMG	0	0	0	0	0	8000	0	0	800	0	0	0	8800
	12 GA SG	0	0	0	0	1265	3200	0	0	410	0	0	0	4875
	3030 Rifle	0	0	0	0	0	0	0	0	0	0	300	0	300

Table 4-2 (Continued)
Projected FY 2000 Small Arms Firing at Camp Edwards

Range	Ammunition Type	Oct. 1999	Nov. 1999	Dec. 1999	Jan. 2000	Feb. 2000	Mar. 2000	Apr. 2000	May 2000	Jun. 2000	July 2000	Aug. 2000	Sept. 2000	Totals
MILITARY AND CIVILIAN WEAPONS FIRING														
KD	7.62 MM	6972	13	400	0	200	0	4986	0	0	15420	6295	10728	45014
	5.56 MM	36583	4009	526	0	663	8223	37981	8760	21525	5927	6553	12360	143110
	.308 Rifle	0	0	0	0	0	450	0	0	0	0	0	0	450
	30-06 Rifle	0	0	0	0	0	100	0	0	0	0	270	0	370
	.308 Rifle	0	0	0	0	0	0	2200	0	0	0	0	0	2200
	9 MM SMG	1500	0	0	0	0	0	0	0	800	0	0	0	2300
	9 MM Rifle	0	0	0	0	0	0	250	0	0	0	0	0	250
L	40 MM (TP)	5790	3313	0	0	0	1092	830	845	817	685	407	817	14596
MRFR	5.56 MM	235185	80799	7379	3241	3187	125604	91951	49520	63581	16604	11804	33526	722381
MPMR	5.56 MM MG	7693	1887	0	0	363	1270	3629	5479	4318	5008	3847	2794	36288
	7.62 MM	59193	14519	0	0	2792	9773	27922	42162	33227	38532	29597	21499	279216
N	5.56 MM	45680	32863	0	0	0	0	17157	2628	5374	2570	2647	0	108919
	9 MM	144	0	0	0	0	0	0	0	0	0	0	0	144
	.357 Pistol	150	0	0	0	0	0	0	0	0	0	0	0	150
	.380 Pistol	120	0	0	0	0	0	0	0	0	0	0	0	120
O	7.62 MM	0	0	0	0	0	0	0	0	0	0	0	1654	1654
	5.56 MM MG	0	0	0	0	0	0	0	0	0	0	0	408	408
	9 MM	1789	397	0	0	0	671	151	580	909	0	1417	1287	7201
	.38 Pistol	3625	200	0	0	0	1470	300	1050	1335	0	1200	1900	11080
	.40 Pistol	0	400	0	0	0	150	0	0	440	0	0	200	1190
	9 MM SMG	7500	0	0	0	0	0	0	0	1500	0	5350	3000	17350
	12 GA SG	3155	480	0	0	0	485	2260	505	650	0	2465	1750	11750

Table 4-2 (Continued)
Projected FY 2000 Small Arms Firing at Camp Edwards

Range	Ammunition Type	Oct. 1999	Nov. 1999	Dec. 1999	Jan. 2000	Feb. 2000	Mar. 2000	Apr. 2000	May 2000	Jun. 2000	Jul. 2000	Aug. 2000	Sept. 2000	Totals
MILITARY AND CIVILIAN WEAPONS FIRING														
P	5.56 MM	4053	0	0	0	0	1962	0	0	0	0	0	0	6015
	9 MM	534	1351	0	0	0	0	25	0	137	0	0	0	2047
	.357 Pistol	0	0	0	0	0	0	300	0	0	0	0	0	300
	.38 Pistol	650	0	0	0	0	0	0	0	0	0	0	0	650
	.380 Pistol	0	0	0	0	0	0	60	0	0	0	0	0	60
	.40 Pistol	50	0	0	0	0	0	180	0	0	0	0	0	230
	12 GA SG	0	0	2500	0	0	0	0	0	0	0	0	0	2500
T	9 MM	0	0	0	0	0	5790	0	0	5579	0	0	0	11369
	.50 Cal	9714	4363	0	2684	2684	0	22831	5359	0	16916	6702	0	71253
U	9 MM	0	2526	0	0	0	7495	0	0	0	0	0	2105	12126
ISBC	40 MM (TP)	101	0	0	0	0	173	0	0	527	163	441	615	2020
	5.56 MM	4223	0	0	0	0	7263	0	0	22081	6808	18456	25733	84564
	7.62 MM	1213	0	0	0	0	2087	0	0	6345	1957	5303	7395	24300
MOUT-MAC	5.56 MM	5854	3980	1872	1940	1748	5172	6524	5066	18181	14250	5835	6042	76464
	7.62	1240	843	397	411	371	1096	1382	1073	3851	3019	1237	1280	16200
	40 MM (TP)	0	0	0	0	0	0	0	470	469	469	469	0	1877
	5.56 MM (Blank)	5154	3504	1647	1708	1538	4553	5743	4459	16008	12549	5136	5318	67317
MOUT-CTF	5.56 MM	8433	5734	2696	2794	2518	7451	9398	7298	26195	20535	8404	8704	110160
	7.62 MM	1102	750	353	365	329	974	1229	954	3423	2684	1099	1138	14400
	.50 Cal (Blank)	271	184	87	90	81	240	302	235	843	661	270	280	3544

Table 4-2 (Continued)
Projected FY 2000 Small Arms Firing at Camp Edwards

Range	Ammunition Type	Oct. 1999	Nov. 1999	Dec. 1999	Jan. 1999	Feb. 2000	Mar. 2000	Apr. 2000	May 2000	Jun. 2000	Jul. 2000	Aug. 2000	Sept. 2000	Totals
MILITARY AND CIVILIAN WEAPONS FIRING														
Various Locations (Blank)	5.56 MM	44490	30246	14223	14741	13281	39307	49578	38498	138190	108330	44336	45914	581134
	7.62 MM	4594	3123	1469	1522	1371	4059	5120	3976	14271	11187	4579	4741	60012
	.50 Cal	1788	1216	572	593	534	1580	1993	1548	5555	4355	1782	1846	23362
	TOTAL	**743,208**	**323,165**	**46,153**	**65,857**	**43,824**	**410,770**	**431,250**	**259,120**	**507,934**	**344,044**	**206,958**	**297,271**	**3,679,554**

Source: Camp Edwards, 1996.

Table 4-3
Projected FY 2000 Mortar and Artillery Firing at Camp Edwards

Ammunition Type	Oct. 1999	Nov. 1999	Dec. 1999	Jan. 2000	Feb. 2000	Mar. 2000	Apr. 2000	May 2000	Jun. 2000	Jul. 2000	Aug. 2000	Sept. 2000	Totals
60 MM Mortar HE	0	83	0	0	101	0	142	54	300	0	14	177	871
60 MM Mortar WP	0	5	0	0	7	0	9	4	21	0	1	12	59
60 MM Mortar ILLUM	0	7	0	0	9	0	12	5	27	0	1	16	77
81 MM Mortar HE	0	55	0	0	68	0	95	26	194	0	9	114	561
81 MM Mortar WP	0	6	0	0	8	0	10	15	20	0	0	10	69
81 MM Mortar ILLUM	0	2	0	0	4	0	8	2	13	0	0	8	37
120 MM Mortar HE	0	29	0	0	0	29	20	19	0	0	0	0	97
120 MM Mortar WP	0	5	0	0	0	5	3	3	0	0	0	0	16
120 MM Mortar ILLUM	0	0	0	0	0	0	0	0	0	0	0	0	0
155 MM HOW LITR	0	326	0	0	0	326	326	326	0	0	0	0	1,304
Totals	**0**	**518**	**0**	**0**	**197**	**360**	**625**	**454**	**575**	**0**	**25**	**337**	**3,091**

Source: Camp Edwards, 1996.

result in short-term increases of criteria pollutants (see Section 4.1.3). Best management practices will be used during range construction, to minimize these emissions.

4.1.1.1 Range Scenario 1

Existing Conditions. The location of the five proposed projects within Scenario 1 are presented in Figure 2-5 and Figures 2-8 through 2-12. Three of the project sites (MRFR, MOUT-MAC and MOUT-CTF) are currently wooded, undeveloped sites adjacent to the impact area. The two remaining projects (MPMR and ISBC) are proposed at existing ranges, thereby requiring the conversion of the SE/SW and IBC ranges, respectively. No air pollutant emissions sources currently exist at the three undeveloped sites. Existing air pollutant emissions at the MPMR and ISBC project locations are the result of weapons firing. The type and total number of rounds fired at each of these existing ranges in FY 1994 is presented in Table 4-4. The existing annual pollutant emissions (pounds per year [lbs/year]) for Range Scenario 1 are also shown in Table 4-4. These emissions are based on the pollutant emission factors provided in Appendix E for the different munitions types and the number of rounds fired in FY 1994.

Table 4-4
Range Scenario 1, Existing Weapons Firing and Associated Air Emissions (FY 1994)

Existing Range	Munitions Type	Number of Rounds Fired	Annual Pollutant Emissions (lbs/year)					
			VOC	NO_x	CO	SO_2	PM	Lead
SE/SW (MPMR)	5.56 mm	44,311	0.0	<0.1	98.4	0.3	11.7	0.4
	7.62 mm	154,947	0.0	0.1	484.0	9.0	50.6	0.0
	9 mm	250	0.0	<0.1	0.6	<0.1	0.1	0.0
Subtotal		**199,508**	**0.0**	**0.1**	**582.9**	**9.3**	**62.4**	**0.4**
IBC (ISBC)	5.56 mm	40,749	0.0	<0.1	90.5	0.3	10.7	0.4
	7.62 mm	1,798	0.0	<0.1	5.6	0.1	0.6	0.0
	40 mm TP	647	0.0	<0.1	1.4	<0.1	0.2	0.0
Subtotal		**43,194**	**0.0**	**0.0**	**97.5**	**0.4**	**11.5**	**0.4**
Total		**242,702**	**0.0**	**0.1**	**680.5**	**9.7**	**73.8**	**0.8**

Note: Numbers may not total due to rounding.

Impacts. Annual air pollutant emissions for the proposed Range Projects within Scenario 1 were estimated based on the small arms projected to be fired at these sites in FY 2000 and emissions factors presented in Appendix E. These estimated emissions are presented within Table 4-5.

Pollutant-specific emissions rates (pounds of pollutant per round) were developed for 5.56 mm, 7.62 mm, and 0.50 caliber rounds (see Appendix E). Pollutant emission rates for other smaller arms fired at Camp Edwards were assumed to be the same as emission rates for a 5.56 mm round.

Table 4-5
Range Scenario 1, Projected Weapons Firing and Associated Air Emissions (FY 2000)

Proposed Ranges	Munitions Type	Number of Rounds Fired	Annual Pollutant Emissions (lbs/year)					
			VOC	NO_x	CO	SO_2	PM	Lead
MRFR, MPMR, ISBC, MOUT-MAC, and MOUT-CTF	5.56 mm	1,097,174	0.0	0.3	2436.2	8.3	288.7	9.9
	7.62 mm	334,116	0.0	0.2	1043.7	19.3	109.2	0.0
	0.50 cal	3,544	0.0	<0.1	69.2	0.2	14.5	0.0
	Other (#)	3,897	0.0	<0.1	8.7	<0.1	1.0	<0.1
Total		**1,438,731**	**0.0**	**0.5**	**3557.7**	**27.8**	**413.5**	**9.9**

# All other small arm rounds.

Note: Numbers may not total due to rounding.

The projected increase in emissions (Projected Emissions minus Existing Emissions) of CO is estimated to be approximately 1.5 TPY. The change in emissions for the other criteria pollutants are estimated to be less than 0.25 TPY. The increase in annual criteria pollutant emissions due to the five proposed Range Projects will not approach the threshold rates set forth in the USEPA's General Conformity Rule, 40 CFR 51.853 (50 tons/year for VOCs and NO_2, and 100 tons/year for other criteria pollutants), nor are they considered regionally significant as defined by 40 CFR 51.853.

As discussed in Section 3.3.2.2, a Limited Plan Application (310 CMR 7.02(2)(b)) is required for any facility where the construction, substantial reconstruction or alteration would result in an increase in potential emissions equal to or greater than one TPY and less than five TPY as calculated over any consecutive 12 month time period. These potential emissions include any criteria air contaminant or the sum of the emissions of all non-criteria air contaminants. The proposed Range and Cantonment Projects will require a Limited Plan Application.

The proposed projects, located within an Attainment Area (except ozone), will emit less than 250 TPY of any criteria pollutant and is not subject to review under the federal Prevention of Significant Deterioration (PSD) program.

Although located in an Non-attainment area (serious) for ozone, the proposed projects will emit less than 50 TPY of either VOCs or oxides of nitrogen, which are precursors to ozone formation, and will emit less than 100 TPY of other pollutants subject to regulation under the CAA. Therefore, the proposed projects at MMR are not classified as Major Stationary Sources for which Non-attainment review under 310 CMR 7.00 Appendix A is required.

Mitigation. No mitigation is necessary.

4.1.1.2 Range Scenario 2

Existing Conditions. The location of the five proposed projects within Scenario 2 are presented in Figure 2-6 and Figures 2-13 through 2-17. Three of the project sites (ISBC, MOUT-MAC and MOUT-CTF) are currently wooded, undeveloped sites adjacent to the impact area. No air pollutant emissions sources currently exist at these sites. The two remaining projects (MRFR and MPMR) will require the conversion of existing ranges, M (abandoned J1) and I Range, respectively. No emission sources currently exist at M range as no weapons were fired in FY 1994. Existing air pollutant emissions at the MPMR project location are the result of weapons firing. The type and total number of rounds fired at this location in FY 1994 are presented in Table 4-6.

Table 4-6
Range Scenario 2 and 3, Existing Weapons Firing and Associated Air Emissions (FY 1994)

Existing Ranges	Munitions Type	Number of Rounds Fired	Annual Pollutant Emissions (lbs/year)					
			VOC	NO$_x$	CO	SO$_2$	PM	Lead
I Range (MPMR)	5.56 mm	40,512	0.0	<0.1	90.0	0.3	10.7	0.4
	9 mm	102,257	0.0	<0.1	227.1	0.8	26.9	0.9
	.357 caliber	3,600	0.0	<0.1	8.0	<0.1	0.9	<0.1
	.38 caliber	13,600	0.0	<0.1	30.2	0.1	3.6	0.1
	.45 caliber	2,750	0.0	<0.1	6.1	<0.1	0.7	<0.1
	12-gauge	5,680	0.0	<0.1	12.6	<0.1	1.5	0.1
Total		**168,399**	**0.0**	**0.0**	**373.9**	**1.3**	**44.3**	**1.5**

Note: Numbers may not total due to rounding.

Impacts. Air pollutant emissions for the five proposed Range Projects within Scenario 2 have been estimated as discussed in Scenario 1. The type and total number of rounds projected to be fired at the five proposed projects within Scenario 2 are identical to Scenario 1 and are presented in Table 4-5. Based on the pollutant emission factors (see Appendix E) for the different munitions types and the number of rounds projected to be fired in FY 2000 for the five proposed projects, the annual pollutant emissions (lbs/year) associated with Range Scenario 2 are identical to those emissions presented in Table 4-5.

The projected increase in emissions of CO is estimated to be approximately 1.6 TPY. The change in emissions for the other criteria pollutants are estimated to be less than 0.25 TPY. As in Scenario 1, the increase in annual pollutant emissions due to the five proposed Range Projects will not approach the threshold rates set forth in 40 CFR 51.853 nor are they considered regionally significant. As discussed in Section 4.1.1.1, a Limited Plan Application will be required.

Mitigation. No mitigation is necessary.

4.1.1.3 Range Scenario 3

Existing Conditions. The location of the five proposed projects within Scenario 3 are presented in Figure 2-7 and Figures 2-18 through 2-21. Three of the project sites (MPMR, MOUT-MAC and MOUT-CTF) are currently wooded, undeveloped sites adjacent to the impact area. No air pollutant emissions sources currently exist at the three undeveloped sites. The two remaining projects (MRFR and ISBC) will require the conversion of the existing ranges, I and M Range (abandoned J1), respectively. No emission sources currently exist at M Range as no weapons were fired in FY 1994. Existing air pollutant emissions at the MRFR project location are the result of weapons firing. The type and total number of rounds fired at this location in FY 1994 are the same as described for Scenario 2 (see Table 4-6).

Impacts. Air pollutant emissions for the five proposed Range Projects within Scenario 3 have been estimated as discussed in Scenario 1 and 2. The type and total number of rounds projected to be fired at the five proposed projects within Scenario 3 are identical to Scenario 1 and are presented in Table 4-5. Based on the pollutant emission factors provided in Appendix E for the different munitions types and the number of rounds projected to be fired in FY 2000 for the five proposed projects, the annual pollutant emissions (lbs/year) associated with Range Scenario 3 are identical to those emissions shown in Table 4-5.

The projected increase in emissions of CO is estimated to be approximately 1.6 TPY. The change in emissions for the other criteria pollutants are estimated to be less than 0.25 TPY. As in Scenario 1 and 2, the increase in annual pollutant emissions due to the five proposed Range Projects will not approach the threshold rates set forth in 40 CFR 51.853 nor are they considered regionally significant. As discussed in Section 4.1.1.1, a Limited Plan Application will be required.

Mitigation. No mitigation is necessary.

4.1.1.4 No Action Alternative

Under this scenario, there will be no new range construction, and weapons firing will continue at the same locations as in FY 1994. MOUT-MAC or MOUT-CTF training will not be conducted at MMR. See Section 4.12 for a discussion of basewide emissions under No Action.

4.1.2 Cantonment Projects

This section describes the existing air quality conditions at each of the Cantonment Project alternative locations and potential project-related impacts and mitigation. Existing air pollutant emissions sources in the Cantonment Area generally result from aircraft operations, military vehicle repair, and facility heating/cooling requirements. See Section 3.3.2 for a summary of MMR air quality conditions. The Cantonment Projects do not represent new sources of air pollutant emissions. The activities associated with the Cantonment Projects currently exist at MMR and will not be increased as a result of implementation. Therefore, air pollutant emissions resulting from the Cantonment Projects will not result in an increase in overall emissions. Sample calculations for estimating Cantonment Project emissions are presented in Appendix E. A short-term increase of criteria pollutant emissions will result during construction of these facilities (see Section 4.1.3). Best management practices will be used during construction to minimize these emissions. As discussed in Section 4.1.1.1, a Limited Plan Application will be required.

4.1.2.1 Unit Training Equipment Site

The three alternative locations of the UTES facility are presented in Figures 2-23 through 2-25. Alternatives 1 and 2 involve the construction of new facilities while Alternative 3 involves renovating the existing UTES facility.

Existing Conditions. No air pollutant emissions sources currently exist at alternative locations 1 and 2. Air pollutant emissions sources at the existing UTES facility result from degreasing, welding, and painting operations, as well as miscellaneous chemical use and diesel engine exhaust from repair and testing of heavy equipment. The No Action Alternative will involve the continued use of the existing UTES facility with no new construction or renovation. Existing sources of air pollutant emissions for the No Action Alternatives are the same as those described above for Alternative 3.

Impacts. Air pollutant emissions associated with the UTES project alternatives would result from the combustion of natural gas for heating/cooling requirements. Table 4-7 provides an estimate of the annual pollutant emissions (lbs/year) for all the Cantonment Projects. Table 4-7 assumes the heating/cooling systems use natural gas and operate 8,760 hours per year (24 hours/day times 365 days/year). Additional emissions would result from maintenance operations such as degreasing, painting, and welding. However, these emissions will not represent an increase in emissions as these activities are currently ongoing and the number of vehicles currently maintained in the UTES facility would not increase with the construction of a new or renovated facility. Other additional air pollutant emissions would result during construction activities (see Section 4.1.3); however, these emissions will be minimal and short-term.

Mitigation. No mitigation is necessary.

Table 4-7
Estimated Emissions from Proposed Cantonment Area Projects *

Proposed Facility	Annual Pollutant Emissions (lbs/year) +					
	VOC	NO_2	CO	SO_2	PM	Lead
UTES	35.3	924.2	194.1	5.5	110.9	0.0
Airfield Control Tower	9.5	247.0	51.9	1.5	29.6	0.0
AGU Facility	18.7	489.0	102.7	2.9	58.7	0.0
Fire Station	20.1	526.0	110.5	3.2	63.1	0.0
Environmental Facility	12.1	315.0	66.1	1.9	37.8	0.0
Total	**95.7**	**2,501.2**	**525.3**	**15.0**	**300.1**	**0.0**

* These emissions will replace similar emissions associated with existing operations. The net project-related emissions increase will be significantly less than the estimated emissions in this table.

+ USEPA air pollutant emission factors (AP-42) were used to estimate emissions based upon natural gas boiler capacities for facilities. Annual emissions assumes boiler operation for 8,760 hours per year.

4.1.2.2 Airfield Control Tower

There are two alternative locations for the proposed construction of a new control tower within the Cantonment Area, as presented in Figure 2-26. A No Action Alternative is also evaluated, requiring the continued use of the existing control tower.

Existing Conditions. Under Alternative 1, the Airfield Control Tower will be located immediately adjacent to the existing control tower. Existing air pollutant emissions are associated with the heating and cooling of the existing control tower. No other emissions sources have been identified. Alternative 2 will require the construction of the Airfield Control Tower north of Building 3122 in an open area adjacent to the flightline. No air pollutant emissions sources exist at this location. Emissions sources for the No Action Alternative are similar to those discussed for Alternative 1.

Impacts. Air pollutant emissions associated with the Airfield Control Tower project alternatives would result from the combustion of natural gas for heating/cooling requirements. The estimated annual potential pollutant emissions are presented in Table 4-7. Additional air pollutant emissions would result during construction activities (see Section 4.1.3); however, these emissions will be minimal and short-term.

Mitigation. No mitigation is necessary.

4.1.2.3 Aircraft Generation Unit Facility

There are two alternative locations for the proposed construction of the AGU Facility, as presented in Figure 2-27. A No Action Alternative is also evaluated, requiring the continued use of Building 158.

Existing Conditions. Under Alternative 1, the AGU facility will be located southwest of Building 158 on an existing aircraft apron. Existing air pollutant emissions sources include aircraft taxiing and queuing, and aerospace ground equipment operations. Alternative 2 will require the demolition of Building 163 which is an empty aircraft hangar presently used for cold storage. There are no existing air pollutant emission sources at this location. Emissions sources for the No Action Alternative are similar to the existing operation of Building 158 as discussed for Alternative 1.

Impacts. Air pollutant emissions associated with the AGU project alternatives would result from the combustion of natural gas for heating/cooling requirements. The estimated annual potential pollutant emissions are presented in Table 4-7. Additional air pollutant emissions would result during construction activities (see Section 4.1.3); however, these emissions will be minimal and short-term.

Mitigation. No mitigation is necessary.

4.1.2.4 Fire Station

There are four alternative locations for the proposed fire station, as presented in Figures 2-28 and 2-29. A No Action Alternative requiring the continued use of the existing fire station, is also evaluated.

Existing Conditions. Under Alternative, 1 a new Fire Station will be constructed along the flightline where Building 128 is located. This will require the demolition of Building 128 which is currently vacant with no existing air pollutant emissions sources. Alternative 2 would be constructed at the current location of Building 3122. Building 3122 is currently vacant and has no existing air pollutant emissions sources. Alternative 3 will require the demolition of Building 126 which is currently vacant and also has no existing air pollutant emissions sources. The fourth alternative will require the construction of an addition to the existing Fire Station. Existing air pollutant emissions from the Fire Station are associated with the heating and cooling of the building and diesel emissions from vehicles. Existing emissions sources for the No Action Alternative are associated with the operation of the existing Fire Station.

Impacts. Air pollutant emissions associated with the Fire Station project alternatives would result from the combustion of natural gas for heating/cooling requirements. The estimated annual potential pollutant emissions are presented in Table 4-7. Additional air pollutant emissions would result during construction activities (see Section 4.1.3); however, these emissions will be minimal and short-term.

Mitigation. No mitigation is necessary.

4.1.2.5 Environmental Facility

The two alternative locations for the new Environmental Facility are located across from the existing IRP office (Building 322) and just north of the Lingley Avenue and East Inner Road rotary (see Figure 2-30). A No Action Alternative will result in no new construction and the continued use of multiple buildings throughout MMR.

Existing Conditions. Both Alternatives 1 and 2 will be located in undeveloped grassy areas where no sources of air pollutants emissions currently exist. Existing air pollutant emissions sources for the No Action Alternative are associated with the heating and cooling requirements of the various environmental buildings currently in use.

Impacts. Air pollutant emissions associated with the Environmental Facility project alternatives would result from the combustion of natural gas for heating/cooling requirements. The estimated annual potential pollutant emissions are presented in Table 4-7. Additional air pollutant emissions would result during construction activities (see Section 4.1.3); however, these emissions will be minimal and short-term.

Mitigation. No mitigation is necessary.

4.1.3 Construction-related Emissions

Construction activities will generate short-term criteria pollutant emissions associated with land clearing and operation of construction equipment. Table 4-8 provides an estimate of construction-related emissions. These emissions represent a worst-case scenario because all 10 projects were assumed to be constructed simultaneously over a three-month period. It is unlikely all 10 projects will be constructed simultaneously. Construction activities will most likely take place over several years. In addition, the emissions presented in Table 4-8 (specifically PM10) do not account for mitigating measures such as use of watering trucks, prohibiting construction during periods of high wind, and covering and stabilizing unused soil piles. These measures will reduce PM10 emissions by up to 50 percent. Also, PM10 emissions were based on emission factors for total suspended particulates which result in conservatively high pollutant emissions because total suspended particulates include those particles greater than 10 μg in diameter. PM10 emissions include only those particulates with a diameter less than 10 μg. Sample calculations for estimating construction-related emissions are presented in Appendix E.

Table 4-8
Construction-Related Emissions (tons)

Proposed Projects	VOC	NO_x	CO	SO_2	PM	Lead
Range Projects	0.1	1.3	1.0	0.1	81.8	0.0
Cantonment Projects	0.1	1.4	0.6	0.1	39.7	0.0
Total	**0.2**	**2.7**	**1.6**	**0.2**	**121.5**	**0.0**

1 Emission calculations were based on the assumption that construction activities would occur simultaneously over a three month period.
2 Emission factors used in the construction related emissions calculations were based on USEPA's AP-42 document (USEPA, 1995).
3. Emissions estimates do not reflect implementation of any mitigating measures.

4.2 Noise

This section describes the existing and future noise sources associated with the project alternative locations, potential impacts, and mitigation. For a summary of the existing (baseline) noise environment at MMR, see Section 3.3.3.

Noise contours were prepared from data provided by both the U.S. Army (U.S. Army Environmental Hygiene Agency, 1996a and 1996b) and the USAF. As described in Appendix F of this report, the contours for the different types of noise sources were computer generated using models and descriptive parameters (such as range location, firing points and directions, etc.). Cumulative noise contours delineating the three land use compatibility zones were generated by combining the noise zones resulting from small arms, heavy weapons, and aircraft flight operations into a composite or cumulative set of contours.

Because the Range and Cantonment projects do not affect future aircraft activity, existing aircraft noise levels (see Figure 3-3) are not expected to change and were not included for analysis within this section. Small arms, and mortar and artillery projected to be fired in FY 2000 at the proposed project locations and existing ranges are shown in Tables 4-2 and 4-3, respectively.

The following paragraphs describe the specific activities and sources of noise associated with the proposed projects that have the potential to change the overall noise environment on MMR and in the communities adjacent to MMR.

4.2.1 Range Projects

The noise impacts from the five Range Projects are evaluated in terms of four alternatives; three range scenarios and the No Action Alternative.

The following subsections address the noise impacts associated with each of the range scenarios on a cumulative basis.

4.2.1.1 Scenario 1

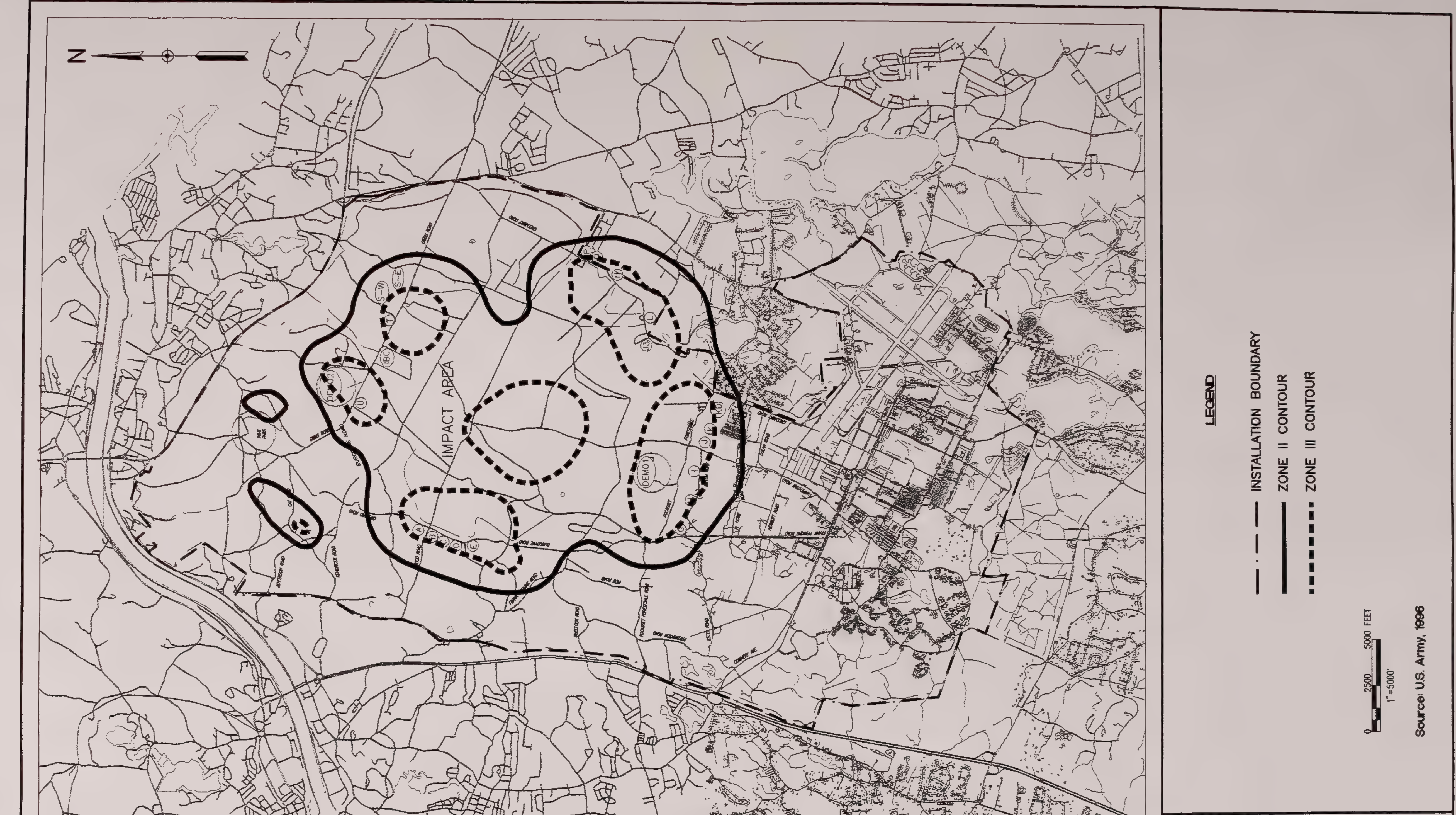
Existing Conditions. Existing noise sources at the Range Project alternative locations are associated with small arms firing and weapons training. The type and number of rounds fired at the existing SE/SW and IBC Ranges are listed in Table 4-4. As shown in Section 3.3.3, Zone III areas currently extend off-post in the vicinity north of Snake Pond and east of Greenway Road (see Figure 3-1). This Zone III area is associated with weapons firing activities. Zone II areas currently extend off-post in the vicinity of Snake and Peter's Pond, and west of Ranges N, O, and P (see Figure 3-1). These Zone II areas are associated with aircraft activities and weapons firing, respectively.

Impacts. The cumulative noise contours for Range Scenario 1 are shown on Figure 4-1. These projected noise contours are then compared to the existing conditions noise contours (Figure 3-2). Range Scenario 1 produces no noticeable effect on the extent of Zones II or III beyond the MMR boundary. In addition, because the ranges would be constructed north and west of the Impact Area, away from base boundaries and residential areas, Scenario 1 would result in no change to the Zone II contour that currently extends beyond the MMR boundary in the vicinity of Forestdale and Snake Pond (see Figure 3-2).

Mitigation. Range Scenario 1 would not further extend Zone III noise contours off-post, however, U.S. Army Regulation 200-1 requires on-site noise monitoring be conducted to address the existing conditions. Noise monitoring was conducted at O Range in September 1996 to validate noise modelling results. Monitoring results indicated prior noise modelling (see Figure 3-2) was accurate and Zone III noise levels do extend off-post adjacent to Range O. Use of N, O, and P Ranges could be restricted to reduce the occurrences of off-post Zone III noise. Permanent on-site or off-site noise monitoring would not be necessary.

4.2.1.2 Scenario 2

Existing Conditions. Existing noise sources at the Scenario 2 alternative locations are associated with small arms firing and weapons training. The type and number of rounds fired at these existing ranges are listed in Table 4-6. As discussed under Scenario 1, existing Zone III and II areas extend off-post.



Source: U.S. Army, 1996

**PROJECTED NOISE CONTOURS
RANGE SCENARIO 2**

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Figure 4-2

Impacts. The cumulative noise contours for Range Scenario 2 are shown on Figure 4-2. A slight increase of the Zone II and Zone III areas which extend off post in the vicinity of Snake Pond and Forestdale would result from the construction and operation of the MRFR immediately southwest of N Range. The remaining Range Projects under this scenario would not result in any changes to off-post Zone III or II areas.

Mitigation. Mitigation would be similar to the measures discussed under Scenario 1.

4.2.1.3 Scenario 3

Existing Conditions. Existing noise sources at the Scenario 3 alternative locations are associated with small arms firing and weapons training. The type and number of rounds fired at the existing MRFR and ISBC Ranges is the same as described for Scenario 2 (see Table 4-6). As discussed under Scenario 1, existing Zone III and II areas extend off post.

Impacts. The cumulative noise contours for Range Scenario 3 are shown on Figure 4-3. A slight increase of the Zone III area which extends off post east of N Range would result from construction and operation of the ISBC under Scenario 3. A slight increase in the Zone II area extending off post in the vicinity of Snake Pond and Forestdale would also result.

Mitigation. Potential mitigation includes constructing a large berm to deflect noise away from residences. This mitigation will significantly increase project costs.

4.2.1.4 No Action Alternative

Noise impacts associated with the No Action Alternative are not expected to result in changes to the noise environment. Under no action, noise contours would be similar to the contours shown in Section 3.3.3.3 (see Figure 3-2). Mitigation would be similar to those measures discussed in Scenario 1.

4.2.2 Cantonment Projects

The five Cantonment projects and associated alternatives as described in Section 2.0 consist of either new construction of buildings or renovation of existing structures. These projects consist of a UTES, Airfield Control Tower, AGU Facility, Fire Station, and Environmental Facility.

Existing Conditions. Existing noise sources at the Cantonment Project alternative locations are associated with aircraft taxiing and queuing (all Airfield Control Tower, AGU, and Fire Station alternative locations), and diesel equipment repair and testing (UTES

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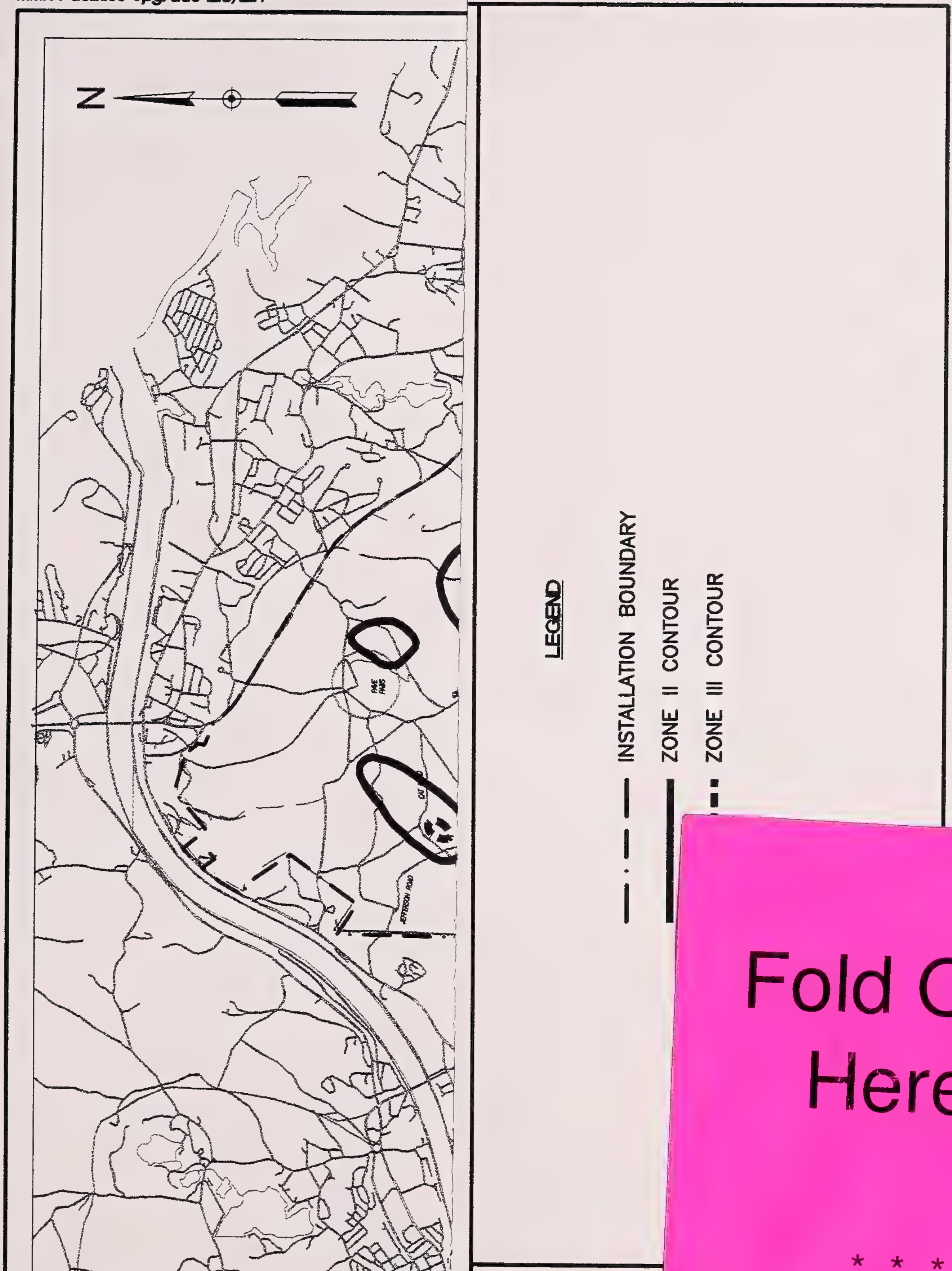

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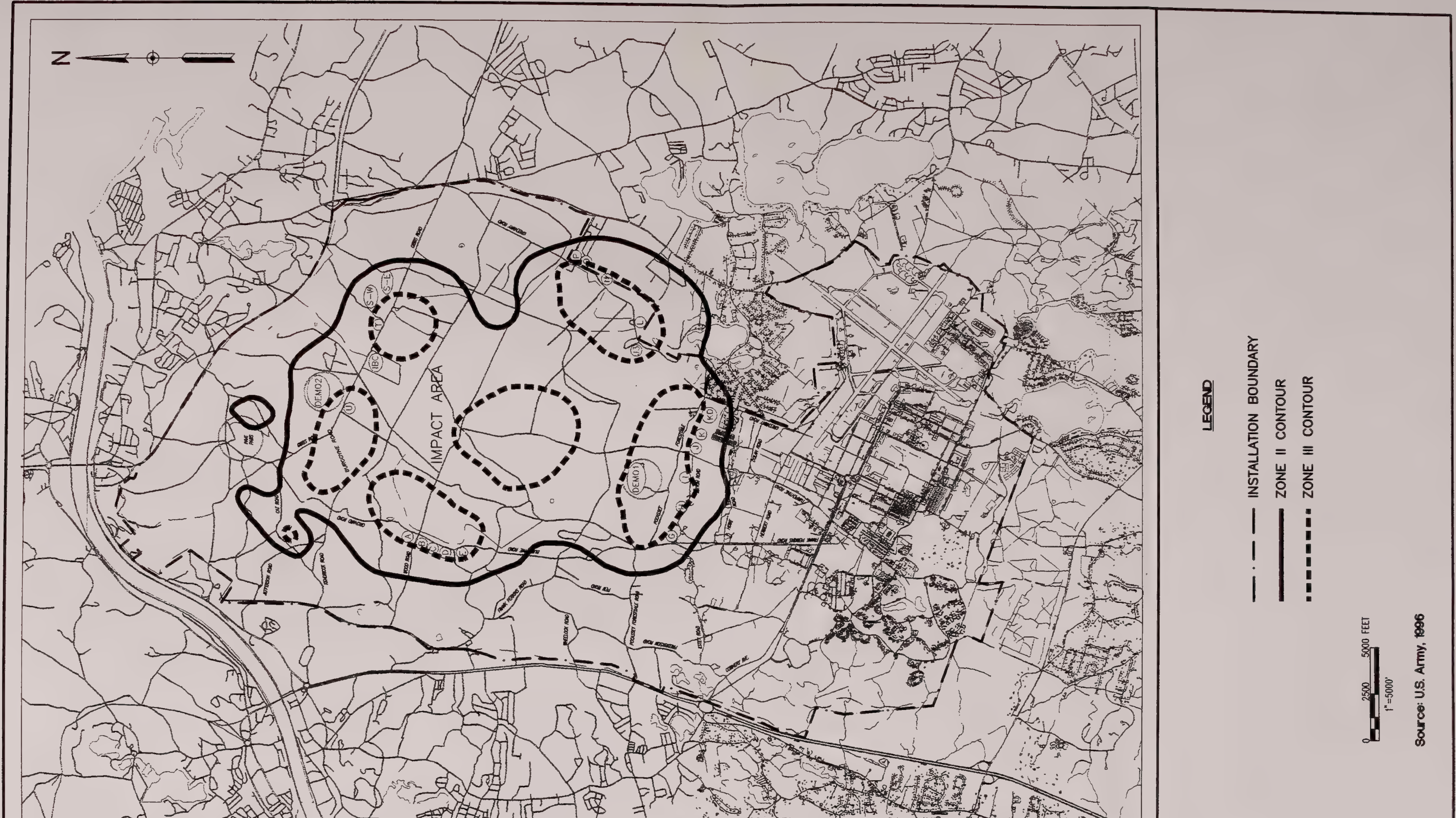

Source: U.S. Army, 1996

PROJECTED NOISE CONTOURS
RANGE SCENARIO 3

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Figure 4-3

Alternative 3 and No Action, and AGU - No Action). The Environmental facility alternative locations and UTES Alternatives 1 and 2 are proposed in undeveloped or vacant areas where noise sources currently do not exist.

Impacts. New sources of noise associated with the operation of proposed projects consist of small fans and air compressors related to building heating, ventilation, and air conditioning system. These sources of noise will not affect the outdoor noise environment in the vicinity of noise sensitive receptors such as residences, churches, hospitals, or outdoor passive recreation areas, either on or off MMR. In most cases, the new minor noise sources will replace existing similar sources because the existing facilities are proposed to be demolished as a result of the particular alternative selected. Furthermore, Cantonment projects are not expected to cause either increases or decreases in aircraft operations or vehicular traffic.

A temporary increase in noise caused by construction equipment may be experienced during the demolition of existing facilities and construction of new structures.

Mitigation. A temporary increase in noise may occur during the demolition of vacant structures and construction of new facilities. However, construction activities may be restricted to daylight hours thereby minimizing the potential disturbance of residential areas both on and off base. No mitigation is required for the daily operation of the proposed projects. These activities currently exist within MMR and are not expected to have an adverse impact on MMR and the surrounding communities.

4.3 Earth Resources

This section presents potential project-related impacts to topography and soils, and mitigation measures for the Range and Cantonment Projects.

4.3.1 Topography

4.3.1.1 Range Projects

Existing Conditions. As described in Section 3.3.4.2, the topography at the MMR property is variable, with steep changes in elevation near Pine Hill, steep gradients near kettle holes and ponds and gently sloping areas within the Cantonment Area.

Impacts. Each of the Range Projects have specific design requirements to ensure ranges will allow for meeting training goals and provide training realism. Army range design manuals require avoiding disturbance to the existing surroundings as much as possible to minimize potential impact to the environment and to provide training realism (U.S. Army, 1988a). However, some modifications to the existing topography may be necessary to construct the ranges. In addition, temporary surface water runoff and erosion impacts would result during construction of the Range Projects. No impacts would result under the No Action Alternative.

Mitigation. Only those areas where topography is required to be altered to provide line-of-sight between firer and target (within firing lanes), accommodate the physical requirements of the equipment, and allow for the necessary construction will be disturbed. The terrain in other areas within proposed Range Projects will not be altered.

Standard erosion control barriers consisting of hay bales or silt fences will be constructed around any disturbed areas and maintained throughout the construction of proposed project. Surface drainage patterns will be evaluated and addressed and mitigated as part of the range design process.

4.3.1.2 Cantonment Projects

Existing Conditions. All existing and proposed locations for the Cantonment Projects are either within a developed portion of the Cantonment Area, or on flat grassland areas.

Impacts. Short-term erosion and surface drainage impacts may result during the construction of these facilities.

Mitigation. Standard erosion control barriers consisting of hay bales or silt fences will be constructed around any disturbed areas and maintained throughout the construction of the proposed projects. Drainage structures will also be constructed to capture the excess surface water runoff caused by the construction of the facilities and associated paved areas.

4.3.2 Soils

Existing Conditions. As described in Section 3.3.4, most of MMR lies within the southern portion of the Sandwich moraine and a glacial outwash plain consisting of coarse to medium sand overlying fine to very fine sand and silt. The soils overlying the outwash deposits consist of a well-drained, sandy loam.

Impacts. The potential for metals to accumulate in berms at the Range Project alternative locations exists. A potential also exists for lead to "smear" onto soils because of each round's velocity upon impact. As discussed in Section 3.3.4, downward migration of metals in soils at the MMR impact area from historical small arms use occurs at rate of approximately 2 to 3 inches per year (USACOE, 1996b). Elevated concentration of metals were detected in the subsurface soils at a maximum depth of 5 to 6 ft bls. These soil samples were taken at locations in front of berms which are the most likely locations for the highest concentrations of metals.

Mitigation. Studies have been conducted to determine the potential long-term effects of metals in soils and groundwater resulting from weapons firing at MMR. These studies include predicting the vertical migration potential for metals from weapon firing activities in soils beneath the Camp Edwards firing ranges (USACOE, 1996b). In addition, DoD has directed the Army to conduct a subsequent study that includes groundwater modeling. Results of the vertical migration study will be applied to the groundwater model to predict potential groundwater recharge impacts to the aquifer underlying the impact area at Camp Edwards, as well as to predict potential contaminant migration patterns. These studies are ongoing. Study results available prior to completion of this EIS/EIR will be incorporated into the Final EIS/EIR. Study results available after release of the Final EIS/EIR will be made available to the public through informational forums and fact sheets. In addition, MAARNG will evaluate potential treatment technologies to address metals detected in existing firing range soils.

The following enhancements can be incorporated (individually or in combination) in the range design and construction to prevent the migration of metals from the soils in berms at the proposed ranges:

- additives to chemically fixate metals in soil
- use of clay liners under berms to control downward migration
- bullet traps to capture bullets after they pass through the target.
- use of environmentally designed concrete which absorbs and fixates bullets 3 to 6 inches into the concrete. Periodic maintenance of these concrete berms will allow the bullets to be removed and for the lead in these bullets to be recycled. This technology is currently being tested by the U.S. Army Environmental Center, and results are expected to be available in Spring 1997.

4.4 Water Resources

Existing conditions for water resources at MMR are discussed in Section 3.3.5. Potential impacts and mitigation to surface water and groundwater, water quality, and wellhead protection are discussed below. Wetland resources are discussed in Sections 3.4.1 and 4.5.

4.4.1 Surface Water

Impacts. As stated in Section 3.3.5, only intermittent streams that form during moderate to heavy rainfall exist at MMR. Several small ponds (less than 10 acres) exist on MMR. These ponds are located near the Otis Fish and Game Club, and in the housing area near the southwestern border of MMR. The Range and Cantonment project alternatives are not located near any of these ponds. In addition, most new roads and parking areas will be surfaced with crushed stone rather than impervious material, minimizing project-related surface water runoff. No impacts to surface water bodies are expected to result from the construction and operation of the range and Cantonment project alternatives.

Mitigation. All construction activities will be conducted in accordance with Camp Edwards and Otis ANGB Stormwater Pollution Prevention Plans, and best management practices will be followed.

4.4.2 Groundwater

Impacts. As discussed in Section 4.3.2, the potential for metals to accumulate in and in front of berms at the Range Project alternative locations exists. This results in the potential for metals to leach into groundwater through the infiltration of rainwater. However, as discussed in Section 3.3.4, downward migration of metals in soils beneath berms at Camp Edwards occurs slowly (2 to 3 inches per year) and elevated concentrations of metals were not detected below 6 ft bls. In addition, metals (with the exception of lead) were not detected in monitoring well samples taken as part of the Long Range Water Supply study. Lead was detected in one monitoring well (Long Range Water Supply study) located NW of the MMR boundary and east of Route 28 at a concentration of 0.017 mg/L. The federal primary drinking water standard is 0.015 mg/L at the tap. It is not known if the firing ranges or impact area is the source of this lead. No impacts to groundwater are expected to result from the construction or operation of the proposed Range Projects. Additionally, no impacts to groundwater are expected to result from construction or operation of the proposed Cantonment Projects.

Mitigation. Although impacts to groundwater from the proposed ranges are not expected, the potential for metals (resulting from historic use of Camp Edwards' ranges) to migrate does exist. Mitigation measures such as those discussed in Section 4.3.2 will be employed at the proposed range projects to impede future metals migration. In addition, studies are currently being conducted to determine potential soil and groundwater impacts resulting from past weapons firing (see Section 4.3.2). These studies will investigate whether or not the impact area is a potential source of contamination to the groundwater. Study results available prior to completion of this EIS/EIR will be incorporated into the Final EIS/EIR. Study results available after release of the Final EIS/EIR will be made available to the public through informational forums and fact sheets.

4.4.3 Water Quality

Based on implementation of mitigating measures discussed above, no impacts to groundwater quality are expected to result from construction and operation of the Range or Cantonment project alternatives.

4.4.4 Wellhead Protection

Impacts. With the exception of the following Range Project alternatives, MRFR (Scenario 1), MPMR (Scenarios 1 and 2) and ISBC (Scenarios 2 and 3), no other Range or Cantonment project alternatives are located within wellhead protection areas (Figure 4-4). Of these five Range Project alternatives located within a wellhead protection area, there are no activities associated with these alternatives that conflict with the Zone II restricted activities outlined in the Massachusetts CWA (310 CMR 22.00) and the MMR Groundwater Protection Policy (MMR Environmental Committee, 1996). Therefore, no impacts to wellhead protection areas are expected to result from the construction and operation of the Range or Cantonment Project alternatives.

Mitigation. MAARNG will coordinate the design of projects located within the Wellhead Protection zone with MADEP to ensure compliance with the Massachusetts CWA 310 CMR 22.00 and the MMR Groundwater Protection Policy (MMR Environmental Committee, 1996).

4.5 Biological Resources

Biological resources at each of the proposed locations, and potential impacts to these resources, are discussed in the subsections below. In general, impacts to vegetation, surface water bodies, wetlands, and endangered species could occur both as a result of construction or development of each site, and operation and maintenance of each site.

The primary impacts during construction/development are loss of habitat and displacement of wildlife. Increased erosion/sedimentation during construction could have short-term impacts on nearby surface water bodies and wetlands. Once construction and site development are complete, primary impacts to biological resources will be those associated with increased use of these project areas, which could decrease the value of any additional open habitat (e.g., open areas associated with the firing ranges) to species that might be likely to utilize such habitat.

The amount of habitat lost is evaluated for each range scenario by considering the amount of each type of habitat affected, relative to the total amount available at MMR. The projects proposed in the Cantonment Area will result in relatively little disturbance to undeveloped areas. The impact evaluation for proposed projects within the Cantonment Area focuses on potential impacts to the state endangered upland sandpiper and to the

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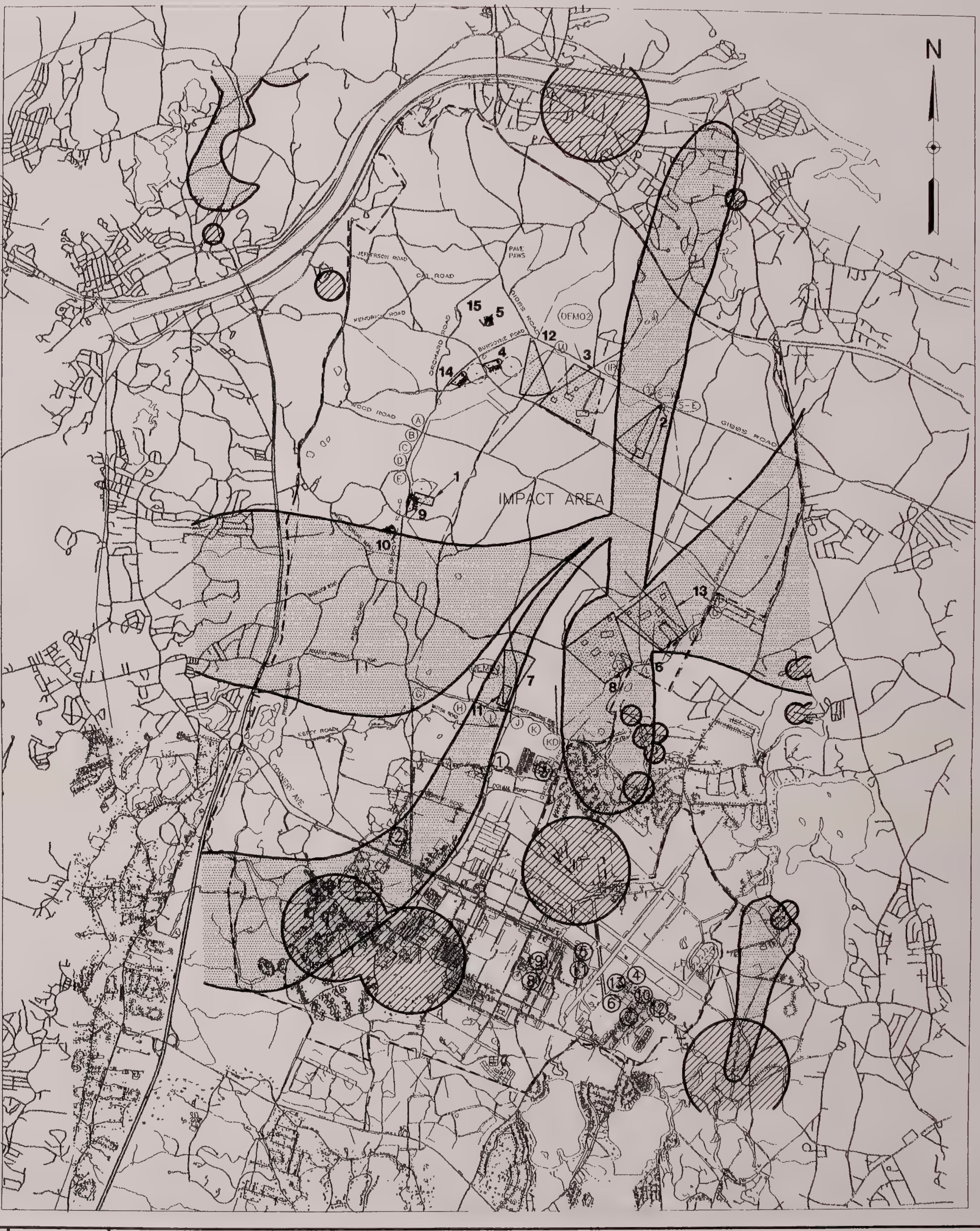

LEGEND

— · — · — INSTALLATION BOUNDARY

░ ZONE II

▨ INTERIM WELLHEAD PROTECTION AREA

CANTONMENT PROJECT ALTERNATIVES:

① UTES PROJECT ALTERNATIVE #1
② UTES PROJECT ALTERNATIVE #2
③ UTES PROJECT ALTERNATIVE #3
④ AIRFIELD CONTROL TOWER PROJECT ALTERNATIVE #1
⑤ AIRFIELD CONTROL TOWER PROJECT ALTERNATIVE #2
⑥ AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVE #1
⑦ AIRCRAFT GENERATION UNIT FACILITY PROJECT ALTERNATIVE #2
⑧ ENVIRONMENTAL FACILITY PROJECT ALTERNATIVE #1
⑨ ENVIRONMENTAL FACILITY PROJECT ALTERNATIVE #2
⑩ FIRE STATION PROJECT ALTERNATIVE #1
⑪ FIRE STATION PROJECT ALTERNATIVE #2
⑫ FIRE STATION PROJECT ALTERNATIVE #3
⑬ FIRE STATION PROJECT ALTERNATIVE #4

SCENARIO #1:

1. PROPOSED MRFR
2. PROPOSED MPMR
3. PROPOSED ISBC
4. PROPOSED MOUT–MAC
5. PROPOSED MOUT–CTF

SCENARIO #2:

6. PROPOSED MRFR
7. PROPOSED MPMR
8. PROPOSED ISBC
9. PROPOSED MOUT–MAC
10. PROPOSED MOUT–CTF

SCENARIO #3:

11. PROPOSED MRFR
12. PROPOSED MPMR
13. PROPOSED ISBC
14. PROPOSED MOUT–MAC
15. PROPOSED MOUT–CTF

NOTE:
SOME ZONE II AND INTERIM WELLHEAD PROTECTION EXTREME BOUNDARIES HAVE NOT BEEN COMPLETELY DEFINED

0 2500 5000 FEET
1" =5000'

Source:
Camp Edwards Environmental Protection Office

PROJECT ALTERNATIVES, ZONE II AND INTERIM WELLHEAD PROTECTION AREAS

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Figure 4-4

grasshopper and vesper sparrows, state-threatened species. These species are known to occur at and/or nest in the Cantonment Area. The state-threatened northern harrier has also been observed on MMR. The range area on MMR contains swamp, bog, old field, or clearcut areas typically used by the harrier for nesting.

4.5.1 Range Projects

Biological resources present at each of the proposed alternative locations, potential impacts, and mitigation are discussed below.

4.5.1.1 Scenario 1

Modified Record Fire Range - Range Scenario 1

Existing Conditions. The proposed MRFR location for Range Scenario 1 is shown on Figure 2-8. The area consists of ridges and several steep-sided basins. There are very large boulders on ridgetops throughout this area. Most of the area is pitch pine/mixed oak forest. Grasses and forbs (non-grass meadow plants) such as goldenrods are found primarily in openings and along roadsides at the edges of this area.

There is a small depression at the southwest corner of the area, east of the junction of Monument Beach and Burgoyne Roads. This depression is dominated by oak, but there are a few plants typical of wet areas, including sensitive fern and pussy willow. The remaining project area, including several fairly deep depressions between ridges, conforms to the overall pitch pine/mixed oak forest pattern.

Birds observed include hermit thrush, Baltimore oriole, northern flicker, pine warbler, rufous-sided towhee, and house wren. Mammals observed include white-footed mouse, short-tailed shrew, southern redbacked vole, and white-tailed deer (tracks).

Impacts. Under Scenario 1, small areas of pitch pine/mixed oak forest will be cleared or altered for the construction of the range support facilities, target locations, and line of sight between firer and targets at the MRFR. The clearing/alteration of forest could displace species that prefer forested habitats. The areas affected comprise less than 1 percent of the total acreage of this habitat available at MMR. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested habitat that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Multi-Purpose Machine Gun Transition Range - Range Scenario 1

Existing Conditions. The proposed MPMR location is shown on Figure 2-9. Plant communities in this large area are relatively diverse, which may be due to the amount of open and occasionally moist habitat in this area. The existing ranges (SE and SW) are primarily composed of mixed grasses and forbs, while the woodlands bordering and separating the ranges contain the pitch-pine/mixed oak community typical of MMR. Although these woodland patches are not as diverse as the surrounding fields, invasion of open-area plants along their edges give these woodland patches a higher species composition than is typical in most pine-oak woodlands on the base. There are many weedy species along old road corridors, but also a few species (e.g., bead-grass, *Paspalum setaceum*) that are uncommon at MMR.

A palustrine emergent wetland is located approximately 100 ft east of the proposed support area (see Figure 2-9). This area, referred to as Grassy Pond, is approximately 100 ft in diameter.

A large number of passerine bird species (i.e., perching birds and song birds) have been observed at the Sierra ranges, including prairie warbler, pine warbler, hermit thrush, eastern bluebird, and Baltimore oriole. A variety of sparrows, including song sparrow, chipping sparrow, field sparrow, and state-threatened vesper sparrow have also been observed at the Sierra ranges. The variety of birds recorded reflects the variety of habitats in this area: short grass at the firing line, tall grass/shrub over most of the range, and the wooded area between the SE and SW ranges. SE/SW ranges are the only locations on MMR other than the airfield where vesper sparrows have been observed. Mammals observed at this location include southern redbacked vole, white-footed mouse and meadow vole. Meadow voles are uncommon in other portions of the training area, although they are common in the Cantonment area.

No other rare or unique species or habitats are known to occur in this area.

Impacts. A small amount of forest and shrub habitat will be cleared or altered for construction of range support facilities, target locations, and line of sight between firer and targets at the proposed site. In addition, some of the existing grass/open areas at this location may be disturbed during construction of range targetry; however, this area will be maintained as grass/open area. The clearing/alteration of forest and shrub habitat could displace species that prefer these habitats. The amount of forested, shrub, and grass/open area that will be affected comprises only a small percentage (<1 percent) of the total acreage of these habitats available at MMR.

Grassy Pond, located approximately 100 ft east of the proposed support area, could potentially be affected by increased sedimentation as a result of site development activities.

This project location is the only location other than the airfield where state-threatened vesper sparrows have been observed at MMR. Meadow voles, uncommon throughout other portions of the training area, have also been observed here. The clearing of forest and shrub habitat is unlikely to adversely affect these species, and could possibly be beneficial, because the resulting grassy habitat is preferred by both the state-threatened vesper sparrow and the meadow vole. Grassy habitat is also preferred by the state-listed grasshopper sparrow and upland sandpiper. However, the more frequent use of these areas by personnel, and the nature of the activities conducted at this firing range, will decrease the value of any additional open habitat. Impacts to other wetland resources and plant or animal species of special concern are not anticipated.

Mitigation. Grassy Pond will be delineated according to regulations promulgated under the MADEP Wetlands Protection Act. Impacts to Grassy Pond are unlikely provided that a 100-foot buffer zone around the wetland area is maintained and erosion control barriers such as silt fencing or hay bales are placed upgradient of the wetland during site development activities. As mentioned in Section 3.4.1.2, design, construction, and operation of the proposed MPMR facility will be coordinated with the USACE, MADEP, and town conservation commissions to ensure that federal, state, and local wetland permitting requirements are met. Construction specifications should include provisions to ensure that flow patterns into the wetland are not affected by the development and use of the site. They should also provide as much contiguous forest as possible surrounding Grassy Pond to allow for movement of amphibian species between the forest and wetland area. Construction in this area should be avoided in March and April when amphibian species will need unimpeded access into and out of this breeding area.

The amount of forest and shrub habitat that will be affected comprises only a small percentage of the total acreage of these habitats available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Infantry Squad Battle Course - Range Scenario 1

Existing Conditions. The proposed ISBC location is shown on Figure 2-10. The proposed site, located at the existing IBC range, consists of open grass/forbs fields and areas of scrub on the margins. There is a large diversity of species in this area, especially grasses and late-flowering forbs such as asters and goldenrods. The site is similar in many respects to the SE/SW Ranges discussed above (Scenario 1, MPMR), although, in general, there is less woodland and more shrub vegetation. At this site, American hazelnut (*Corylus americana*) is the dominant shrub.

An aspen community extends from U Range into the existing IBC Range. Vegetation along the roads passing through this area consists primarily of pitch pine and species common to dry, open roadsides. No animals were observed during the site survey, but species are likely to be similar to those discussed above for the MPMR.

Impacts. A small amount of forest shrub vegetation will be cleared or altered for construction of range support facilities, target stations, and line of sight between firer and targets. The grass/open area at this location will remain unchanged and will be maintained as grass/open area. The clearing/alteration of forest and shrub habitat could displace species that prefer these habitats. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested and shrub acreage that will be affected comprises only a small percentage of the total acreage of these habitats available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Military Operations on Urbanized Terrain-Military Assault Course - Range Scenario 1

Existing Conditions. The proposed MOUT-MAC location is shown on Figure 2-11. The roadside portion of this proposed location contains vegetation typical of roadsides/power line areas at MMR. The wooded area around a depression at the center of this site has a canopy of pitch pine and various oaks. The depression itself lacks a canopy, has high light penetration, and is covered in scrub oak and greenbrier. Along the top edge of the depression are a few red maples (*Acer rubrum*).

Animals observed in the area include blue jay, white-tailed deer (sign) and one red-backed salamander.

Impacts. As part of the construction of the proposed site, a small amount of forest will be cleared. The clearing of forest habitat will displace species that prefer forested habitats. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested acreage that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Military Operations on Urbanized Terrain-Collective Training Facility - Range Scenario 1

Existing Conditions. The proposed MOUT-CTF location is shown on Figure 2-12. The plant community in the vicinity of the proposed site on Monument Swamp Road is dominated by sweet fern, scrub oak, bracken, *Rubus*, and grasses: species common in areas with nutrient poor soil and high light penetration. A number of snags are present in this area, most of which have either fallen or been blown to the ground. To the north of the road the species composition is similar, except that most of the snags in this area are still standing. The vegetation quickly transitions to a pitch pine/mixed oak canopy.

Animal species observed include red-tailed hawk, blue jay, and eastern chipmunk.

Impacts. As part of the construction of the proposed site, a small amount of forest will be cleared. The clearing of forest habitat will displace species that prefer forested habitats. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested acreage that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Scenario Summary

The primary impact to biological resources is the loss of habitat from development of these sites, and possibly a slight increase in disturbance of wildlife as a result of increased use of these areas. The forest and shrub habitat that might be affected under Scenario 1 comprises only a small proportion of the total acreage of these habitats available at MMR. Grassy Pond is the only wetland resource that potentially could be affected by site development activities; potential impacts to the wetland and sensitive amphibian species that breed in the wetland can be avoided by implementation of preventative measures as part of the site development process. These preventive measures may include delineation of the wetland boundary and maintenance of a 100-foot buffer zone, placement of erosion control barriers, avoiding construction in March and April when amphibians use this pond as a breeding area, and ensuring that flow patterns around the wetland are not permanently disrupted. No impacts to other wetland resources and plant or animal species of special concern are anticipated.

4.5.1.2 Range Scenario 2

Modified Record Fire Range - Range Scenario 2

Existing Conditions. The proposed MRFR location under Range Scenario 2 is shown on Figure 2-13. The area in the vicinity of the proposed MRFR location supports a variety of plant communities. To the north and south of the ranges are forests dominated by white oak, a common community along Greenway Road. Between the ranges and Greenway Road are thickets dominated by wild raisin (*Viburnum cassinoides*) and southern arrowwood (*V. dentatum*), a relatively common community in the NE section of MMR. Along the roads leading into the impact area, the plant community has been altered by the clearing and maintenance of fire breaks. These areas are dry sand and are dominated by pitch pine, sweet fern, *Rubus*, grasses, and goldenrods.

Animal species observed at this location include whitetail deer (tracks), domestic cat (sign), black-capped chickadee, red-tailed hawk (pair) and American crow. Eastern bluebirds were observed nesting in snags in N Range during spring of 1995.

Impacts. Under Scenario 2, small areas of forest will be cleared or altered for the construction of the range support facilities, target locations, and line of sight between firer and targets at the MRFR. The clearing/alteration of forest habitat could displace species that prefer forested habitats. The areas affected comprise less than 1 percent of the total acreage of this habitat available at MMR. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested acreage that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Multi-Purpose Machine Gun Transition Range - Range Scenario 2

Existing Conditions. The proposed MPMR location is shown on Figure 2-14. From the existing I range NW to Demo 1, and east to Turpentine Road, the area is a homogeneous post-burn plant community. These burn areas are dominated by scrub oak and standing snags; sheep laurel, sweet fern, and black cherry are also common. To the north, the unburned area on both sides of Turpentine Road is dominated by white oak, similar to many areas along Greenway Road. Under the oak canopy, huckleberry and checkerberry are common understory species. Moving south along the east side of Turpentine Road, pitch pine replaces white oak as the dominant canopy species. Gray birch is more common in this area than in other portions of this site.

While most of the vegetation along Turpentine Road is common to roadsides (e.g., goldenrods and asters), there is one section with steeplebush. This occurs along a section of road where standing water remains in a small depression (approximately 10 by 5 ft) that has been enlarged over time by tire tracks. Although not a wetland by either state or federal standards, it is of biological interest. During the summer of 1994, anuran tadpoles were observed in water in this depression, suggesting that it may function as a vernal pool. The development of this area along a periodically used road suggests that it can tolerate small disturbances and may be compatible with the proposed uses for this area.

Blue jays and raccoon (sign) were observed at this area.

No other rare or unique species or habitats are known to occur in this area.

Impacts. A small amount of forest and shrub habitat will be cleared or altered for construction of the range support facilities, target locations, and line of sight between firer and targets at the MPMR. The clearing/alteration of forest and shrub habitat could displace species that prefer these habitats. The amount of forested and shrub habitat that will be affected comprises only a small percentage of the total acreage of these habitats available at MMR.

The small depression along Turpentine Road may be disturbed temporarily during vegetation clearing of the firing lanes. Although this area has some wetland and vernal pool characteristics, it does not meet the definition of a wetland by either federal or state agencies. No impacts to other wetland resources and plant or animal species of special concern are anticipated.

Mitigation. Potential impacts to this small depression should be minimal. The fact that it has been enlarged over time by tire tracks and that it has developed in such a way, suggests that it can tolerate such disturbances. The amount of forest or shrub habitat that will be affected comprises only a small percentage of the total acreage of these habitats available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Infantry Squad Battle Course - Range Scenario 2

Existing Conditions. The proposed ISBC location under Range Scenario 2 is shown on Figure 2-15. This location encompasses the J-3 range, currently used by Textron Defense Systems. The southern portion of this site is currently open to medium density coniferous forest, with some shrubby areas. A number of roads and buildings comprise the central portion of the J-3 Range; this area is bordered to the east by shrub vegetation and to the west by a mixture of shrub and forest. The northern portion of the site is primarily a cleared, open, grassy area, with additional forested area to the north.

Impacts. A small amount of forest will be cleared or altered for construction of range support facilities, target stations, and line of sight between firers and targets. The clearing/alteration of forest habitat could displace species that prefer forest habitat. There are currently approximately 24 acres of open area at the J-3 range that will remain unchanged. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested habitat that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Military Operations on Urbanized Terrain-Military Assault Course - Range Scenario 2

Existing Conditions. The proposed MOUT-MAC location under Range Scenario 2 is shown on Figure 2-16, and is the same location as MRFR Scenario 1 (see Section 4.5.1.1).

Impacts. As part of the construction of the proposed site, a small amount of forest will be cleared. The clearing of forest habitat will displace species that prefer forest habitat. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested habitat that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Military Operations on Urbanized Terrain-Collective Training Facility - Range Scenario 2

Existing Conditions. The proposed MOUT-CTF location under Range Scenario 2 is shown on Figure 2-17. This site is similar to other forested areas on Camp Edwards with a canopy of pitch pine and mixed oaks, and an understory of black huckleberry, scrub oak, and blueberries. There is a small area dominated by red maple, suggesting it is more moist than the rest of the site. However, such pockets of red maple can be found throughout much of MMR. At the western and southern edges of the site the land drops off and the vegetation transitions to a forest of sparse pitch pine canopy and dense scrub oak understory; this too is a common habitat on MMR.

Two bird species observed at this site were the blue jay and the black-capped chickadee.

Impacts. As part of the construction of the proposed site, a small amount of forest will be cleared. The clearing of forest habitat will displace species that prefer forest habitat. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested habitat that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Scenario Summary

The primary impact to biological resources is the loss of habitat from development of these sites, and possibly a slight increase in disturbance of wildlife as a result of increased use of these areas. No impacts to wetland resources and plants or animal species of special concern are anticipated.

4.5.1.3 Range Scenario 3

Modified Record Fire Range - Range Scenario 3

Existing Conditions. The proposed MRFR location under Range Scenario 3 is shown on Figure 2-18 and is the same location as MPMR-Scenario 2 (see Section 4.5.1.2).

Impacts. Under Scenario 3, a small amount of shrub vegetation will be cleared or altered for construction of the range support facilities, target locations, and line of sight between firer and targets at MRFR. The clearing of shrub habitat could displace species that prefer this habitat.

The small depression along Turpentine Road that has some wetland and vernal pool characteristics will be unaffected by site development. There are no wetland resources and plant or animal species of special concern likely to be impacted by this project.

Mitigation. The amount of shrub acreage that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Multi-Purpose Machine Gun Transition Range - Range Scenario 3

Existing Conditions. The proposed MPMR location under Range Scenario 3 is shown on Figure 2-19. This area contains a variety of plant communities. The western and central portions of the proposed MPMR site are dominated by a pitch pine/oak community. The presence of red maples and fern-covered hillsides (species undetermined due to timing of survey) indicate some moist areas. However, no wetlands occur in this area.

Depressions along an overgrown road that runs from north to southwest through the proposed MPMR alternative location have more aspens (*Populus* sp.) than the rest of the area. Some notable trees were also observed in these depressions; a white oak with a Diameter at Breast Height (DBH) of 11 inches, a scarlet oak with a DBH of 14 inches, and a pitch pine with a DBH of approximately 24 inches. These represent some of the largest individuals of these species known to occur on MMR. The prevalence of oak thickets in the area indicates a history of timber harvesting from this area at some point in the past.

The NW section of this area is considerably different for the southwest section. There is little canopy, and the area is dominated by scrub oak. Other species, such as glaucous greenbrier and gray birch, are far more common in the NW section than in the south. The plant community suggests that the NW section has been recently (i.e., within one or two decades) disturbed, most likely by fire.

A small depression (approximately 7 ft by 3 ft) that receives run-off from Gibbs Road is located on the western edge of the access road to U Range. Although this small area does not appear to have the hydric soils or hydrology of a wetland, some wetland-related species (e.g., *Scirpus* and *Spiraea tomentosa*) have invaded the area. Along both sides of the entrance road to U Range is a thicket, characterized by wild raisin and grasses, that is similar to thickets NE of the Sierra ranges at MMR. To the south of these thickets is an area dominated by quaking aspen (*Populus tremuloides*). Most of the area, however, consists of the typical forested areas dominated by pitch pine, depressions dominated by scrub oak and sheep laurel, and roadsides with plant communities common to dry, disturbed areas of MMR.

Bird species observed near the proposed MPMR include ruffed grouse, wild turkey (sign), turkey vulture, blue jay, and black-capped chickadee. Mammal signs were also observed, including those of an unidentified canid species, whitetail deer, and an unidentified sciurid species (skull fragment).

Impacts. A small amount of forest shrub habitat will be cleared or altered for construction of the range support facilities, target locations, and line of sight between firer and targets at MPMR. The grass/open area at this location will remain unchanged and will be maintained as grass/open area. The clearing/alteration of forest and shrub habitats could displace species that prefer these habitats.

As noted above, depressions along the overgrown road that crosses through the proposed range area contain notable trees, including specimens of white oak (DBH = 11 inches), scarlet oak (DBH = 14 inches) and pitch pine (DBH = 24 inches) which represent some of the largest individuals of these species known to occur on MMR.

If any of the relatively large tree specimens mentioned above are cleared or topped as part of the site development, significant biological effects are unlikely; these species are not unique to this area of MMR. Impacts to wetland resources and plants or animal species of special concern are not anticipated.

Mitigation. The amount of forest and shrub acreage that will be affected comprises only a small percentage of the total acreage of these habitats available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Infantry Squad Battle Course - Range Scenario 3

Existing Conditions. The proposed ISBC location under Range Scenario 3 is shown on Figure 2-20, and is the same location as MRFR-Scenario 2 (see Section 4.5.1.2).

Impacts. A small amount of forest and shrub habitat will be cleared or altered for construction of range support facilities, target locations, and lines of sight between firer and targets at ISBC. The clearing/alteration of forest and shrub habitat could displace species that prefer these habitats. No impacts to wetland resources and plant or animal species of special concern are anticipated.

Mitigation. The amount of forested and shrub acreage that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Military Operations on Urbanized Terrain-Military Assault Course - Range Scenario 3

Existing Conditions. The proposed MOUT-MAC location is shown on Figure 2-21. This site is located east of Burgoyne Road, north of its intersection with Orchard Road. This area contains pitch pine canopy with an understory of scrub oak and other commonly occurring species. Wild indigo (*Baptisia tinctoria*) was observed along the eastern side of the ridge in this area. Additional species observed include shadbush (*Amelanchier canadensis*), sassafras (*Sassafras albidum*), red maple (*Acer rubrum*), bigtooth aspen (*Populus grandidentata*) and dwarf chestnut oak (*Quercus prinoides*).

Wildlife species observed at this location include an unidentified odonate species and a southern redbacked vole.

Impacts. As part of the construction of the proposed site, a small amount of forest will be cleared. The clearing of forest habitat will displace species that prefer this habitat. No impacts to plant or animal species of special concern are anticipated.

Mitigation. The amount of forested habitat that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. Range projects will be designed to minimize disturbance of existing vegetation and to provide the most realistic training environment possible.

Military Operations on Urbanized Terrain-Collective Training Facility - Range Scenario 3

Existing Conditions. The proposed MOUT-CTF location under Range Scenario 3 is the same as under Range Scenario 1 (see subsection 4.5.1.5 and Figure 2-12).

Impacts. Potential impacts are the same as those discussed for MOUT-CTF under Scenario 1.

Mitigation. Mitigation is the same as discussed under Scenario 1.

Scenario Summary

The primary impact to biological resources is the loss of habitat from development of these sites, and possibly a slight increase in disturbance of wildlife as a result of increased use of these areas. No impacts to wetland resources and plant or animal species of special concern are anticipated.

4.5.1.4 No Action Alternative

Modified Record Fire Range - No Action Alternative

Existing Conditions. Activities at the proposed MRFR currently take place on a number of different ranges (B, C, D, G, H, I, J, K, KD, N, O and P) at MMR. The ecological communities associated with these ranges are those discussed in the basewide ecological characterization (Subsection 3.4). These ranges are generally characterized as having grassy areas near the firing line and shrub or forested areas extending into the impact area.

Impacts. No impacts to biological resources are predicted under the No Action Alternative.

Mitigation. No mitigation is necessary.

Multi-Purpose Machine Gun Transition Range - No Action Alternative

Existing Conditions. Activities at the proposed MPMR currently take place on a number of different ranges (A, D, G, H, KD, SE and SW) at MMR. The ecological communities associated with these ranges are those discussed in the basewide ecological characterization (Subsection 3.4). These ranges are generally characterized as having grassy areas near the firing line and shrub or forested areas extending into the impact area.

Impacts. No impacts to biological resources are predicted under the No Action Alternative.

Mitigation. No mitigation is necessary.

Infantry Squad Battle Course - No Action Alternative

Existing Conditions. An alternative form of the proposed ISBC currently exists at the IBC range. Existing conditions at the IBC are discussed in Subsection 4.5.1.3 (ISBC, Scenario 1).

Impacts. No impacts to biological resources are predicted under the No Action Alternative.

Mitigation. No mitigation is necessary.

Military Operations on Urbanized Terrain-Military Assault Course - No Action Alternative

Existing Conditions. Training activities associated with MOUT-MAC do not currently take place at MMR.

Impacts. No impacts to biological resources are predicted under the No Action Alternative.

Mitigation. No mitigation is necessary.

Military Operations on Urbanized Terrain-Collective Training Facility - No Action Alternative

Existing Conditions. Training activities associated with MOUT-CTF do not currently take place at MMR.

Impacts. No impacts to biological resources are predicted under the No Action Alternative.

Mitigation. No mitigation is necessary.

4.5.2 Cantonment Projects

4.5.2.1 Unit Training Equipment Site

Alternative 1

Existing Conditions. The proposed UTES locations are shown on Figure 2-22. The Alternative 1 location is NE of the intersection of Turpentine and Howe Roads, west of the existing BOMARC missile site (Figure 2-23). It is in a forested area north of the existing UTES vehicle washrack and fuel dispensing site. The forested area is dominated by a pitch pine canopy, with scattered white and black oaks, and common understory species.

Animal species observed at this location include brown-headed cowbird, rufous-sided towhee, and European starling. A state-threatened Cooper's hawk was observed at this location.

A small cattail wetland is located SE of the existing washrack.

No other rare species or unique habitats are known to occur in this area.

Impacts. As part of the construction of the proposed site, approximately five acres of forest will be cleared and covered by either buildings, pavement, or crushed stone. The clearing of forest habitat will displace species that prefer this habitat. The amount of forested acreage that will be affected comprises only a small percentage of the total acreage of this habitat available at MMR. A Cooper's hawk was observed in this vicinity. Provided that this species does not nest within the area to be cleared, adverse impacts are unlikely. The small cattail wetland SE of the existing washrack will not be affected by site development activities. Demolition and site restoration of the existing UTES facility would provide only limited wildlife habitat due to the disturbed nature of the area and on-going IRP activities. No impacts to other species of special concern are anticipated

Mitigation. No mitigation is necessary.

Alternative 2

Existing Conditions. Under this alternative, the UTES facility will be constructed in the 3600 Area of Camp Edwards (Figure 2-24). Open areas were formerly occupied by roads and buildings. This area is primarily covered with vegetation characteristic of old fields and field edges, with scattered pitch pine.

Impacts. The construction of the proposed site will involve clearing of approximately 5 acres of currently developed areas, covered primarily with old field/field edge habitat. Due to the disturbed nature of this area, it provides only limited wildlife habitat. Demolition and site restoration of the former UTES facility would provide limited wildlife habitat. No impacts to wetland resources or plant or animal species of special concern are anticipated.

Mitigation. No mitigation is necessary.

Alternative 3

Existing Conditions. Under this alternative, the existing UTES facility will be renovated (Figure 2-25). This area currently consists of buildings and paved access roads and parking areas. Three small storage buildings will be located in an adjacent area to the south which is currently forested. The forested area is dominated by a low pitch pine canopy (less than or equal to 23 ft high), with a moderately diverse understory. Some species (e.g., pearly everlasting [*Anaphalis margaritaceae*] and Indian hemp [*Apocynum sibiricum*]) are relatively scarce on MMR based on the Camp Edwards floristic survey (Jenkins, 1995a) and other field observations (Camp Edwards, 1996b). Butterfly weed (*Asclepias tuberosa*) is a State Watch List species recorded to occur in the vicinity of the existing UTES facility in 1996. The area to the east of the proposed UTES location, adjacent to Greenway Road, has been designated as a sandplain grasslands critical habitat due to the potential occurrence of sandplain flax. Sandplain flax is a State Species of Special Concern; a historical record from the mid-1980s reported its occurrence along this stretch of Greenway Road. It was not found at this location during the Camp Edwards floristic survey (Jenkins, 1995a) or during several subsequent visits conducted in both 1995 and 1996 and earlier reports of its presence are questioned by these surveys. This area is currently maintained as road-edge by periodic mowing and contains several non-native grass species more typical of a maintained lawn edge. Periodic mowing results in habitat that would support the growth of Sandplain Flax if it does occur at this location.

A small cattail wetland is located to the north of the existing UTES entrance.

Animal species observed at this project location include numerous passerine bird species, such as cedar waxwing, prairie and pine warblers and Baltimore oriole, song sparrow, and brown thrasher. White-footed mouse and green frog have also been observed at this location.

There are no other records of any rare species or unique habitats.

Impacts. Renovation of the existing UTES facility will result in the clearance of a small forested area and construction of three small storage buildings. The cattail wetland, located north of the current UTES entrance, will be delineated in accordance with MADEP regulations. This wetland will be unaffected provided the entrance road is not widened. The State watch list species butterfly weed (*Ascepias tuberosa*) could potentially be impacted if it occurs in the area to be cleared. No other impacts to plant or animal species of special concern are anticipated.

Mitigation. Impacts to butterfly weed will be avoided by surveying the area for this species and placement of fencing around any individual plants to ensure that they are not impacted by construction activities. No additional mitigation is necessary.

No Action Alternative

Existing Conditions. Under the No Action Alternative, the UTES facility location will remain unchanged, in a developed area consisting of buildings and roads surrounded by grassy areas.

Impacts. No impacts to biological resources are anticipated under the No Action Alternative.

Mitigation. No mitigation is required.

4.5.2.2 Airfield Control Tower

Alternative 1

Existing Conditions. Under this alternative, the tower will be constructed in a grassy area immediately SE of the existing control tower (Figure 2-26). This area is largely developed and consists of a mosaic of small grassy areas and buildings, parking areas, and roads. This area does not appear to contain any areas that will provide suitable habitat for either the upland sandpiper, grasshopper sparrow or vesper sparrow.

Impacts. No impacts to biological resources, including the state-listed birds mentioned above, are anticipated. If this alternative is selected, the existing control tower would be demolished and the site restored to an open grass field in accordance with FAA safety zone regulations. This area would provide only limited wildlife habitat.

Mitigation. This project location could be observed during the nesting season to ensure that it is not being used by these species as nesting habitat. No other mitigation is necessary.

Alternative 2

Existing Conditions. Under this alternative, the tower will be constructed at a paved area east of Bradshaw Road, north of Building 3122 (Figure 2-26). This area does not appear to contain any areas that will provide suitable habitat for either the upland sandpiper, grasshopper sparrow or vesper sparrow.

Impacts. No impacts to biological resources are anticipated under this alternative. Demolition and site restoration of the existing control tower would provide very limited wildlife habitat.

Mitigation. No mitigation is necessary.

No Action Alternative

Existing Conditions. Under the No Action Alternative, the Airfield Control Tower will remain unchanged, in a largely developed area.

Impacts. No impacts to biological resources are predicted under the No Action Alternative.

Mitigation. No mitigation is necessary.

4.5.2.3 Aircraft Generation Unit Facility

Alternative 1

Existing Conditions. Under this alternative, the proposed AGU facility will be constructed on part of a large aircraft parking area known as Able Row (Figure 2-27). This area does not contain any areas that will provide suitable habitat for either the upland sandpiper, grasshopper sparrow or vesper sparrow.

Impacts. No impacts to biological resources are anticipated under this alternative.

Mitigation. No mitigation is necessary.

Alternative 2

Existing Conditions. Under this alternative, the proposed facility will be located at what is currently Building 163, located south of Building 158 and adjacent to Able Row (Figure 2-27). This area does not contain any areas that will provide suitable habitat for either the upland sandpiper, grasshopper sparrow or vesper sparrow.

Impacts. No impacts to biological resources are anticipated under this alternative.

Mitigation. No mitigation is necessary.

No Action Alternative

Existing Conditions. Under the No Action Alternative, AGU activities will continue to operate in Building 158.

Impacts. No impacts to biological resources are anticipated under the No Action Alternative.

Mitigation. No mitigation is necessary.

4.5.2.4 Fire Station

Existing Conditions. Under all four alternatives, the new Fire Station (or addition) will be constructed in areas previously disturbed by the past construction of Buildings 128, 3122, 126 or 122 (Figures 2-28 and 2-29). In the case of Alternative 4, the addition will extend into a small grassy area surrounded by other buildings and paved areas. Suitable habitat for either the upland sandpiper, grasshopper sparrow or vesper sparrow does not appear to exist in any of the proposed Fire Station alternative locations.

Impacts. No impacts to biological resources, including the state-listed birds mentioned above, are anticipated. Under Alternatives 1 and 2, the existing Fire Station would be demolished and the site restored to an open, grassy area adjacent to the runway. This new area would provide very limited wildlife habitat.

Mitigation. No mitigation is necessary.

No Action Alternative

Existing Conditions. Under the No Action Alternative, the current fire station will remain intact.

Impacts. No impacts to biological resources are predicted under the No Action Alternative.

Mitigation. No mitigation is necessary.

4.5.2.5 Environmental Facility

Alternative 1

Existing Conditions. Under this alternative, the proposed Environmental Facility will be constructed south of the Lingley Avenue/East Inner Road rotary, directly across from the existing IRP office (Figure 2-30). This area currently is an open, grassy area. This proposed location is located within potential habitat for the state endangered upland sandpiper; it could also be utilized by grasshopper sparrow or vesper sparrow, both state-threatened species (White and Melvin, 1985).

Impacts. Construction of the Environmental Facility and parking area in this location could impact upland sandpipers, grasshopper sparrows, and/or vesper sparrows, if they use this area for nesting. Potential impacts include disruption of mating and nesting activities, destruction of nests by equipment, and loss of nesting habitat. A small amount of potential nesting habitat (i.e., less than 0.5 acre) will be lost by construction of the buildings and parking areas. Upland sandpipers generally prefer nesting and feeding areas having an unobstructed view of the surrounding area and potential predators; the presence of buildings could therefore also potentially decrease the value of this surrounding area as upland sandpiper nesting and feeding areas. The actual impact to these species due to the presence of the buildings once they are constructed is unknown at this time.

Mitigation. Potential impacts to nesting individuals could be avoided by surveying the proposed location during the nesting season to ensure that it is not being used by these species. Provided that construction activities are avoided in this area during the nesting season, direct impacts to individuals of these species are unlikely. Mitigative measures (e.g., offsets) for the habitat lost by construction of the buildings, as well as for the potentially diminished habitat value of the surrounding area to the upland sandpiper will be implemented in accordance with Massachusetts Division of Fish and Wildlife recommendations. Inventories to delineate critical habitat of grassland bird species are ongoing.

Alternative 2

Existing Conditions. Under this alternative, the proposed Environmental Facility will be constructed north of the Lingley Avenue/East Inner Road rotary (see Figure 2-30). This area is currently part of a large, open grassy area. This proposed location is located within potential habitat for the state endangered upland sandpiper; it could also be utilized by grasshopper sparrow or vesper sparrow, both state-threatened species (White and Melvin, 1985).

Impacts. Construction of the Environmental Facility and parking area in this location could impact upland sandpipers, grasshopper sparrows, and/or vesper sparrows, if they use this area for nesting. Potential impacts include disruption of mating and nesting activities, destruction of nests by equipment, and loss of nesting habitat. A small amount of potential nesting habitat (i.e., less than 0.5 acre) will be lost by construction of the buildings and parking areas. Upland sandpipers generally prefer nesting and feeding areas having an unobstructed view of the surrounding area and potential predators; the presence of buildings could therefore also potentially decrease the value of this surrounding area as upland sandpiper nesting and feeding areas. The actual impact to these species due to the presence of the buildings once they are constructed is unknown at this time.

Mitigation. Mitigation is the same as discussed under Alternative 1.

No Action Alternative

Existing Conditions. There is currently no centralized Environmental Facility location. Activities associated with the administrative and laboratory functions of the various environmental offices at MMR currently take place at a number of locations throughout the Cantonment Area.

Impacts. No impacts to biological resources are anticipated under the No Action Alternative.

Mitigation. No mitigation is necessary.

4.6 Land Use

Potential land use impacts are discussed below for the Range and Cantonment project alternatives.

4.6.1 Range Projects

The five Range Projects involve converting abandoned and existing ranges, or developing unused land in the training area around the range impact area. These projects are expansions of existing facilities or provision of new facilities that are similar in nature to existing facilities. Site changes for the proposed Range Projects consist of site clearing, some topographic alterations, and re-vegetation. All of the projects are located within an area currently devoted to range activities and, therefore, do not alter the on-base land use pattern. None of the proposed alternatives for these five projects impact off-base land uses.

4.6.2 Cantonment Projects

The five Cantonment projects involve the renovation, replacement or consolidation of existing facilities at MMR. None of the projects involve a new use or activity. The renovation alternatives involve no changes in land use. The replacement alternatives for each project involve building a new facility in the vicinity of the existing facility. The only land use change for the replacement alternatives involves site development of currently vacant land to accommodate the construction of new facilities, and subsequent demolition of former facilities and development as open, grassy areas. The UTES project requires about eight acres of land and the other four Cantonment projects require less than one acre each. In all cases the replacement facility will be built in an area of existing similar activities. The Environmental Facility involves the consolidation of several different operations to a single location. This location will be on a site in the developed, but vacant, portion of the Cantonment area. In view of the extensive undeveloped land in the Cantonment area, site development resulting from these proposed projects will have no impact on the on-base land use pattern. All proposed alternatives for these five projects have no impact on off-base land uses.

4.7 Cultural Resources

Project-specific existing conditions, potential impacts, and mitigation are provided below. Archeological resources are discussed for both the Range and Cantonment projects. Historic structures are addressed only for the Cantonment projects because no historic or potentially historic structures exist within the Range Project alternative locations or will be affected by the Range Projects. The BOMARC missile complex within the existing UTES complex was surveyed in March 1996. The NGB and MAARNG are in the process of applying NRHP eligibility criteria to the area and will seek concurrence on any determination with the SHPO. Coordination with Native American groups has been initiated in compliance with applicable federal regulations. Appendix C contains copies of relevant correspondence documenting project notification of Native American Groups.

4.7.1 Range Projects

4.7.1.1 Range Scenario 1

With the exception of the MPMR and MOUT-CTF, all other Scenario 1 Range Project alternative locations have a low potential for archeological resources (Davin and Gallagher, 1987) and will not result in impacts to archeological resources.

Multi-Purpose Machine Gun Transition Range - Range Scenario 1

Existing Conditions. This proposed 60-acre facility location will be located north of the Impact Area and south of Gibbs Road. A small kettle pond, Grassy Pond, is located at the north limits of this proposed location, just south of Gibbs Road. This pond is east of and adjacent to the proposed support area (see Figure 2-9). The pond and surrounding area exhibit high potential for archeological resources. The area adjacent to the pond has been disturbed by road construction and by extensive grading and clearing activities during construction of SE/SW Range. The remaining project area is considered to have low potential for archeological resources.

Impacts. Although no archeological resources are known to exist within this alternative location, Grassy Pond and its immediate surroundings do exhibit a potential to contain prehistoric resources. However, the support area is proposed west of Grassy Pond outside the area considered to have high potential. The remaining project area demonstrates a low potential for archeological resources and no impacts (during construction or range operation) within this area are anticipated.

Mitigation. No mitigation is necessary.

Military Operations on Urbanized Terrain-Collective Training Facility - Range Scenario 1

Existing Conditions. This proposed 8-acre alternative location includes and lies adjacent to the known Orchard Road Site (Davin and Gallagher, 1987). This prehistoric site is west of Orchard Road (see Figure 3-11) and extends south for more than 1,000 ft to the intersection with Monument Swamp Road. While the presence of the site is known, the boundaries of the archeological deposition are not. Additionally, one of two historic period farms was located along Monument Swamp Road in proximity to the wetland.

Impacts. Construction and operation of this complex could adversely impact the prehistoric and potential historic resources in this area. Impacts could result from construction activities, vandalism, or inadvertent artifact collection during training and maneuvers.

Mitigation. If NGB and MAARNG determine archeological sites within Range Scenario 1 meet NRHP criteria of eligibility, they will consult with the MHC to determine what effect the proposed action may have on these resources, in compliance with Section 106 of the NHPA. If it is determined that the proposed action will have an adverse effect, NGB and MAARNG will consult with the MHC, other interested persons, and, if necessary, the ACHP, to seek agreement on alternatives to eliminate or reduce the adverse effect. The review process may result in a Memorandum of Agreement or Programmatic Agreement among the consulting parties that outlines stipulations to eliminate, minimize, or mitigate any adverse project impacts.

If in the course of construction or training activities, bones, shell, or prehistoric or historic artifacts are found, all ground-disturbing activities within 30-m of the find will cease immediately and Range-Control and Camp Edwards environmental staff will be notified. Activity will not resume within 30-m of the find until it has been evaluated by a qualified archeologist and the area has been cleared for ground-disturbing activities to continue. If human remains are found and are determined to be of Native American origin, the requirements outlined in the Native American Graves Protection and Repatriation Act shall apply.

4.7.1.2 Range Scenario 2

With the exception of MOUT-CTF, all other Scenario 2 alternative locations are considered to have a low potential for archeological resources.

Military Operations on Urbanized Terrain-Collective Training Facility - Range Scenario 2

Existing Conditions. This facility is proposed in the southwestern quadrant of the intersection of Burgoyne and Monument Beach roads (Figure 2-17). This area is situated close to several find spots where low densities of prehistoric cultural material were found (Davin and Gallagher, 1987; Macomber, 1991). This project area is largely undisturbed and contains low rolling hills with several depressions. Vegetation includes secondary growth such as scrub oak, pine, and blueberry bushes. This area is considered to have moderate potential to contain archeological resources.

Impacts. Impacts will be the same as discussed under MOUT-CTF Scenario 1 above.

Mitigation. Mitigation is the same as discussed in Scenario 1.

4.7.1.3 Range Scenario 3

With the exception of MOUT-CTF, all other Scenario 3 Range Project alternative locations are considered to have a low potential for archeological resources. MOUT-CTF Alternative 3 is the same location as MOUT-CTF Scenario 1, which is considered to have a high archeological sensitivity due to its proximity to the known Orchard Road site. Potential impacts and mitigation are the same as discussed under Scenario 1.

4.7.1.4 No Action Alternative

With the exception of the existing SE/SW Range which is adjacent to Grassy Pond, the remaining ranges at MMR are located in areas previously disturbed by construction and/or grading activities and are considered to have a low potential for archeological resources. Prehistoric resources potentially exist in the vicinity of Grassy Pond, and activities currently conducted at SE/SW (which could continue under No Action) could be adversely impacting these resources. Mitigation will be the same as discussed under Scenario 1.

4.7.2 Cantonment Projects

4.7.2.1 Unit Training Equipment Site

All three UTES alternatives, in addition to No Action, are located in areas disturbed by previous construction and grading activities and are considered to have a low potential for archeological resources. A quartz flake and historic field trash were recovered during the intensive archeological survey for the WWTP. Further testing in this area determined that this was an isolated find spot and that most of the area was disturbed (Macomber, 1991). No impacts are anticipated to archeological resources; however, potential impacts to historic properties may result.

Existing Conditions. The existing UTES complex is located within the former BOMARC missile site (Figure 2-25). A Cold War-era historic properties context for the U.S. Army is currently being developed through several efforts. When made available, the Army will use the context to appropriately evaluate this site as a component of a nationwide military context.

Impacts. Alternatives 1 and 2 will include new construction to the west of and adjacent to, or southwest of the existing UTES facility, respectively. Both alternatives will result in the abandonment of the existing UTES facility. Alternative 3 will involve renovation to the existing UTES complex. Abandonment of the property could constitute an adverse effect to the historic property under Section 106 of the NHPA, if the abandonment results in neglect of the property causing deterioration or destruction. New construction and/or additions to the existing buildings could constitute an adverse effect to the historic property if the new construction/additions will result in the physical destruction, damage, or alteration of all or part of the property. The No Action Alternative will have no adverse impacts on the existing UTES facility.

Mitigation. Mitigation is the same as discussed under MOUT-CTF, Scenario 1 (See Section 4.7.1.1).

4.7.2.2 Airfield Control Tower

Both Airfield Control Tower alternatives, in addition to No Action, are located in areas disturbed by previous construction and grading activities and are considered to have a low potential for archeological resources. No potential impacts to archeological resources by the construction and operation of the Airfield Control Tower are anticipated.

Under Alternatives 1 and 2, the existing Control Tower will be demolished. The existing tower was constructed in 1956 and is not considered eligible for nomination to the NRHP.

4.7.2.3 Aircraft Generation Unit Facility

Both AGU alternatives, in addition to No Action, are located in areas disturbed by previous construction and grading activities and are considered to have a low potential for archeological resources. No impacts are anticipated to archeological resources.

Under Alternative 1, a new facility will be constructed on the aircraft apron southwest of Building 158 (Figure 2-27). This alternative will involve no demolition; therefore, no impacts to historic or potentially historic structures will occur. Alternative 2 will involve the demolition of Building 163. Building 163 is approximately a 27,000-sf aircraft hangar constructed in 1955, which has been abandoned and is used for cold storage. This structure is not considered eligible for nomination to the NRHP.

4.7.2.4 Fire Station

All four Fire Station alternatives, in addition to No Action, are located in areas disturbed by previous construction and grading activities and are considered to have a low potential for archeological resources. No impacts are anticipated by the construction and operation of a new fire station.

Under Alternatives 1, 2, and 3 the existing fire station, along with Buildings 128, 3122, and 126, respectively, will be demolished (Figure 2-28 and 2-29). Both Buildings 128 and 126 are approximately 35,000-sf. Building 128 was constructed in 1955 and Building 126 was constructed in 1952. The existing Fire Station (Building 122) was constructed in 1959. Building 3122 is approximately 26,000 sf and was constructed in 1942. Although this building is greater than 50 years old, it is in disrepair and is planned for demolition regardless of alternative selection. All four buildings are not considered eligible for nomination to the NRHP.

4.7.2.5 Environmental Facility

Both Environmental Facility alternatives are located in open grassy areas or in areas disturbed by previous construction (Figure 2-30) and grading activities and are considered to have a low potential for archeological resources. The No Action Alternative will involve the continued use of multiple offices on MMR. These facilities are considered to have a low potential for archeological resources. No impacts are anticipated to archeological resources and no mitigation is required. None of the alternatives involve demolition or renovation to existing structures. No impacts to historic or potentially historic structures are expected.

4.8 Hazardous Materials and Hazardous Waste Management

The following sections discuss hazardous materials and hazardous waste management practices at the specific project alternative locations, potential impacts, and mitigation. Range Projects are evaluated by each scenario and Cantonment projects are evaluated for each of their respective alternatives.

4.8.1 Range Projects

A description of site-specific existing conditions, potential impacts, and mitigation for each of the Range Scenarios is provided below.

4.8.1.1 Range Scenario 1

Existing Conditions. No hazardous materials, petroleum products, ordnance, or pesticides are stored in any of the Scenario 1 project alternative locations. In addition, no hazardous wastes are currently generated at the proposed alternative locations. No wastewater is generated as a result of existing training activities at SE/SW or IBC. Operating or abandoned ranges currently exist at the proposed MPMR, ISBC and MOUT-CTF locations. These ranges include small ancillary buildings such as storage sheds, range control towers, or latrines. These buildings have the potential to contain asbestos or lead-based paint, although it is unlikely because they were constructed using unfinished wood and/or corrugated metal.

At the proposed location for the MRFR, base overhead electrical lines are located at the western end of the range area (Figure 2-8). Pole-mounted transformers associated with these lines may contain PCBs. There are no overhead electric lines at the proposed MPMR, ISBC, MOUT-MAC and MOUT-CTF locations.

Impacts. No impacts associated with hazardous materials and hazardous waste management are expected to result from implementation of the Scenario 1 alternatives.

Mitigation. Procedures for spill prevention and spill response are in place if a hazardous material spill of any size occur in the field (MAARNG, 1994b). If asbestos or lead-paint are detected on the ancillary building at the existing Range Project locations, it will be abated in accordance with applicable regulations prior to demolition. MAANG has a program to remove and replace all PCB-containing transformers.

4.8.1.2 Scenario 2

Existing Conditions. No hazardous materials, petroleum products, ordnance (with the exception of ISBC Scenario 2), or pesticides are stored in any of the Scenario 2 project alternative locations. Because of past activities in the area near the ISBC Scenario 2 alternative location (Figure 2-15), unexploded ordnance is likely to exist. No hazardous wastes are currently generated at the proposed alternative locations. Operating or abandoned ranges currently exist at the proposed MRFR and MPMR locations. Ancillary buildings at these ranges may contain asbestos or lead-based paint; however, it is unlikely because these buildings were constructed with unfinished wood or corrugated metal. No asbestos or lead paint surveys have been conducted.

Overhead electric lines are present at the proposed locations for the MRFR, ISBC, and MOUT-MAC ranges. Pole-mounted transformers associated with these lines may contain PCBs. There are no overhead lines at the proposed MPMR and MOUT-CTF locations.

Impacts. No impacts associated with hazardous materials and hazardous waste management are expected to result from implementation of the Scenario 2 alternatives; however, unexploded ordnance may exist within the ISBC Scenario 2 alternative location.

Mitigation. Mitigation is the same as discussed under Scenario 1. Should this Scenario be selected for implementation, the soils within the ISBC alternative location will be cleared of all unexploded ordnance prior to beginning construction activities.

4.8.1.3 Scenario 3

Existing Conditions. No hazardous materials, petroleum products, ordnance, or pesticides are stored in any of the Scenario 3 project alternative locations. No hazardous wastes are currently generated at the proposed alternative locations. No wastewater is generated as a result of existing training activities at I Range. Buildings at the proposed MRFR and ISBC locations (I Range and M Range, respectively) may contain asbestos or lead-based paint, although it is unlikely because these buildings were constructed with unfinished wood or corrugated metal. No surveys have been performed. PCB-containing transformers associated with overhead electric lines may be present at the proposed MPMR and ISBC locations.

Impacts. No impacts associated with hazardous materials and hazardous waste management are expected to result from implementation of the Scenario 3 alternatives.

Mitigation. Mitigation is the same as discussed under Scenario 1.

4.8.1.4 No Action Alternative

Under the No Action Alternative, existing range operations will continue and no new construction will occur. Buildings at the ranges may contain asbestos or lead-based paint, although it is unlikely because these buildings were constructed with unfinished wood or corrugated metal. No surveys have been conducted. PCB-containing transformers at ranges with overhead electrical lines may be present.

Impacts. No impacts associated with hazardous materials and hazardous waste management are expected to result from the continuation of existing training activities.

Mitigation. Mitigation is the same as discussed under Scenario 1.

4.8.2 Cantonment Projects

4.8.2.1 Unit Training Equipment Site

Existing Conditions. There are three alternative locations for the construction of a new UTES facility (Figures 2-23 through 2-25). Alternatives 1 and 2 propose the construction of a new UTES facility in currently undeveloped areas. There currently are no petroleum products, ordnance, pesticides or hazardous materials storage at these alternative locations. In addition, there are no PCB-containing transformers, asbestos, lead-based paint, or waste accumulation points in these areas. Alternative 3 proposes the renovation of the existing UTES facility. Currently, a hazardous material storage and satellite accumulation point are located in Buildings 4600 and 4601, respectively. No asbestos or lead-based paint surveys have been conducted in Buildings 4600 and 4601.

The project site for Alternative 1 is currently undeveloped and not serviced with sanitary sewer. Alternative 2 is serviced by an 8-inch sewer main that discharges to the Otis ANGB WWTP.

The No Action Alternative will involve no new construction or renovation of the existing facility. UTES operations will continue in the existing facility along with the storage of hazardous materials and waste in Building 4600 and 4601. Currently, sanitary wastewater is only generated at the existing UTES facility (Alternatives 3 and 4). This wastewater is collected by an 8-inch sewer main and treated in the WWTP. All other waste fluids are collected and stored as hazardous waste in Building 4601, prior to off-base disposal by a licensed contractor.

Impacts. Under Alternatives 1 and 2, hazardous materials and waste will be generated and may pose potential impacts to the public and environment if there was a release. Alternatives 3 and 4 will continue to store the hazardous materials and generate waste at current levels. Sanitary wastewater will be generated under all four alternatives. Sanitary wastewater will continue to discharge into the base sanitary sewer system for treatment at the WWTP under Alternatives 2, 3, and No Action. However, Alternative 1 will require connection to the base sanitary system.

Mitigation. Mitigation is the same as discussed under Range Project Scenario 1.

4.8.2.2 Airfield Control Tower

Existing Conditions. There are two alternative locations for the Airfield Control Tower at MMR, in addition to No Action. Alternative 1 will locate the tower immediately adjacent to the existing tower; Alternative 2 will locate the tower north of Building 3122. Alternative 1 and 2 locations are currently undeveloped and no hazardous materials or waste is stored or generated. Asbestos was identified in the mechanical room of the existing control tower; however, it was removed in 1992. Asbestos was also identified in the pipe insulation; however, it is in good condition and is managed in place. A survey has not been conducted for the presence of lead-based paint. Currently sanitary wastewater is generated at the existing control tower, discharged to the base sanitary system and treated in the WWTP. Sanitary sewer services are currently available in Reilly Road to support the Alternative 1 project location. An 8-inch sewer main currently extends into Alternative 2 project site, but is currently not in use.

Impacts. Since no hazardous materials or waste are stored or generated at any of the proposed locations, there are no potential impacts anticipated. Sanitary sewer services are available for Alternatives 1, 2, and No Action. Design of the service connections will be prepared in conjunction with the new control tower.

Mitigation. Mitigation is the same as discussed under Range Scenario 1. ACM and lead-based paint (if it exists) will be addressed in accordance with applicable regulations prior to demolition of the existing control tower.

4.8.2.3 Aircraft Generation Unit Facility

Existing Conditions. There are two alternative locations for the AGU facility in the Cantonment area of MMR (Figure 2-27), in addition to No Action. Alternative 1 will locate the AGU near Building 158, currently used as an aircraft apron. No hazardous materials or waste are stored at the proposed location; however, a satellite accumulation point is located in Building 158. Alternative 2 will require the demolition of Building 163 and the construction of the AGU in its place. Building 163 is currently vacant. Although no hazardous materials or waste is stored in this location, there is pipe insulation containing asbestos on the first floor of the building. To date, lead-based paint has not been identified in Building 163. Under the No Action Alternative, the AGU facility will continue to share space in Building 158, where hazardous wastes are accumulated prior to disposal off-base by a licensed contractor.

Currently, sanitary wastewater is generated at Buildings 158; however, not at Building 163 which is vacant. Wastewater from Building 158 is collected by the base sanitary system and treated in the WWTP. Alternative 1 consists of an open, undeveloped area, with a sewer main currently available in Reilly Road to support the site. An 8-inch main located in Izzea Street and 6-inch service connection to Building 163 is available for Alternative 2. The No Action Alternative will continue to discharge sanitary wastes into the sewer main in Reilly Road.

Impacts. No impacts associated with hazardous materials or wastes are anticipated.

Mitigation. Mitigation is the same as discussed under Range Scenario 1.

4.8.2.4 Fire Station

Existing Conditions. There are four alternative locations for the construction of a new fire station (Figures 2-28 and 2-29), in addition to No Action. Alternatives 1, 2, and 3 propose the construction of a new fire station where Buildings 128, 3122, and 126 exist, respectively. There are no hazardous materials storage or waste accumulation points in these areas. Alternative 4 proposes to construct an addition to the existing fire station. No

Action assumes continued use of the existing fire station without constructing a new facility or the addition. The fire station does not use hazardous materials or generate hazardous wastes. Asbestos was identified in pipe insulation at the existing fire station and was removed in 1990. To date, lead-based paint has not been identified. Currently sanitary wastewater is only generated at the existing fire station. This is collected by the base sanitary system and treated in the WWTP. Sanitary sewer lines are available in Reilly Road and Bradshaw Road with service connections into each of the proposed sites.

Impacts. No impacts associated with hazardous materials or waste are expected.

Mitigation. Mitigation is the same as discussed under Range Scenario 1.

4.8.2.5 Environmental Facility

Existing Conditions. There are two alternative locations for the construction of the Environmental Facility (Figure 2-30), in addition to No Action. Alternatives 1 and 2 propose the construction of a new Environmental Facility in currently undeveloped areas. Currently, there are no hazardous materials storage or waste accumulation points in these areas. The No Action Alternative will not involve any new construction, but continue to utilize multiple buildings throughout the Cantonment Area of MMR. At present, sanitary wastewater is generated only at the existing Environmental Facilities (Alternative 3). This wastewater is collected by the base sanitary system and treated in the WWTP. Sanitary sewer mains are available in East Inner Road to support Alternatives 1 and 2.

Impacts. No impacts associated with hazardous materials or waste are expected.

Mitigation. Mitigation is the same as discussed under Range Scenario 1.

4.9 Utilities

The following text presents the site-specific existing conditions, potential impacts, and mitigation for utilities present at each of the project alternative locations. Utilities at MMR consist of potable water, solid waste, storm water, electricity and natural gas. Most of these services are limited to the developed areas of MMR, such as the Cantonment Area and the southern region of the Impact Area. Only electric services are currently provided in the Range Area. In general, many of the slight increases in service demand would be offset by service decreases resulting from alternative-related demolition activities.

4.9.1 Range Projects

Existing Conditions. Water supply to the individual Range Project locations is provided by 400-gallon water trucks on an as needed basis. Water supply in the Cantonment Area is provided from Well J.

Solid waste disposal for the Range Project locations is the responsibility of each individual unit training at the range facilities. All solid waste is stored temporarily at the bivouac areas and then transferred to the Cantonment Area for disposal. The volume of solid waste currently generated by the existing IBC and SE/SW ranges and B-10 area is not tracked or quantified.

Storm water is not generated in the project locations as the rain water infiltrates into the ground and recharges the groundwater. Small intermittent streams, if present, are addressed in Section 4.4.

Under Range Scenario 1, overhead electric lines currently exist along Burgoyne Road and Gibbs Road supporting the proposed locations of the MRFR, MOUT-MAC, ISBC and the MPMR. The existing service voltage is three-phase 115 kVA. Electrical services are not available at the proposed MOUT-CTF location, but are located nearby along Burgoyne Road.

For Scenario 2, overhead electric lines currently exist along Burgoyne Road, Greenway Road and Pocasset Road supporting the proposed locations of all five Range Projects. The existing service voltage is three-phase 115 kVA. Four of the five Range Projects in Scenario 3 are serviced by overhead electric lines currently exist along Burgoyne Road, Greenway Road, Pocasset Road and Gibbs Road. The existing service voltage is three-phase 115 kVA. Electrical service is not available at the proposed MOUT-CTF location, but is located nearby along Burgoyne Road.

Natural gas service is not available or required within the Range Area.

Impacts. Overall use of Camp Edwards is projected to decrease from 260,000 man-days in FY 1994 to 244,000 man-days by the year 2000. In addition, the daily utilization rate is projected to stay below the authorized limit of 3,000 personnel per day.

Water supply to the proposed Range Projects will continue to be supplied by water trucks to the range facilities. The number and frequency of deliveries will be made on an as needed basis. Based on the projected utilization rates for FY 2000 there will be no increase in water consumption with the construction and operation of the proposed Range Projects due to the decrease in annual utilization. In addition, the units will continue to transport all waste to their home armories for disposal.

Quantities of solid waste will increase temporarily during construction of the Range Projects. Long-term operation of the Range Projects is not anticipated to increase the generation of solid waste.

The construction of range facilities will not include the construction of a storm water system. The range facilities will consist primarily of open, grassy field surfaces. Parking areas will be constructed with crushed stone and gravel supporting the infiltration of rain water and recharge of the groundwater. Building structures will make up a small portion of the range facilities. Runoff from these structures will drain off onto the open ground surface.

Under Scenario 1, the MRFR and MOUT-MAC Range Projects will require the installation of electrical service connections to the existing overhead lines adjacent to each of the facilities. The MPMR and ISBC projects will be constructed on existing ranges currently serviced with electrical power. The MOUT-CTF training facility is located west of the existing service line and will require installation of overhead lines beginning at Wagners Corner, west then SE along Swamp Road, approximately 4,000 ft in length.

Three of the five Range Project locations in Scenario 2 will require the installation of service connections to existing overhead lines. Both the MRFR and MPMR project locations have electrical service connections. Under Range Scenario 3 the MOUT-MAC and MPMR Range Projects will require the installation of service connections to the existing overhead electrical lines adjacent to each of the facilities. Both the MRFR and ISBC project locations have electrical service connections. The MOUT-CTF training facility is located west of the existing service line and will require installation of overhead lines beginning at Wagners Corner, approximately 4,000 ft in length.

Electrical services will be required to operate the computer target systems of the firing ranges and general lighting and power needs within the range structures and parking areas. The range structures include the range towers, operations/storage buildings, and ammunition breakdown buildings for the MRFR, MPMR and ISBC.

The construction of the electrical services should have no impact on the surrounding environment. New electrical service lines, if necessary, will be installed along existing roadways. The consumption of electricity is expected to increase slightly due to this computerization of the firing ranges and general lighting/power needs. The Commonwealth Electric Company power source can likely support this minor increased demand, if any.

Mitigation. No mitigation is necessary. Commonwealth Electric has sufficient capacity to provide for the project-related increase in power requirements.

4.9.2 Cantonment Projects

4.9.2.1 Unit Training Equipment Site

The proposed UTES facility will require potable water, solid waste disposal, storm water handling, electrical and natural gas services.

Alternative 1

Existing Conditions. This project location is currently undeveloped and does not use any utilities available on base. However, some service lines are adjacent to or are located near the site.

Water supply to the project area is provided by a 10-inch water main which services the existing washrack immediately south of the site. Well J is the primary water source for this distribution system, with connections to the town of Mashpee as a backup system.

Solid waste and storm water are not generated at this site.

Overhead electrical lines are located along the southern portion of the proposed site ending at the intersection of Turpentine Road and Howe Road. This electrical service is a 3-phase, 25 kVA line maintained by MAANG and powered by Commonwealth Electric Company.

Natural gas is not available in this northern extreme of the Cantonment Area.

Impacts. The existing number of personnel associated with UTES (44) and the number of vehicles currently maintained (274) are not expected to increase as a result of any of the UTES alternatives.

Potable water will be required for on-site personnel support (i.e., showers and lavatories) and the equipment washrack. Water demand currently generated by the UTES facility (Section 3.5.4.1) is not expected to increase with the construction of the proposed UTES facility.

Similarly, the volume of solid waste generated by the UTES facility will not increase over current levels. Construction of the UTES facility will generate a temporary increase in solid waste. The former UTES buildings would be demolished and the site cleared to support on-going IRP activities and the historical registration of the adjacent BOMARC facility. This demolition would also generate a temporary increase in solid waste.

Storm water will be generated by the development of approximately 5.6 acres of paved surface, including the maintenance and storage facilities, washrack and inspection racks. A storm water drainage system will be developed as part of the facility design to conform with surrounding site features and specific storm events. A crushed stone parking lot will also be constructed for military vehicle storage that will permit the infiltration of rain water.

Overhead electrical lines are readily available from which a service connection to the UTES facility can be constructed. This service connection will not impact the surrounding environment. Operation of a new UTES facility is not expected to increase electricity requirements.

Natural gas service will be required to provide heating for the multiple structures. The closest gas line is located on the north side of the BOMARC missile shelters from which a service line can be connected. Construction of this service line will not impact the surrounding environment as it will be located alongside an existing roadway.

Mitigation. No mitigation is necessary.

Alternative 2

Existing Conditions. This project location held temporary structures at one time, but is currently cleared, and does not use any existing utilities available on base. Service lines for all utilities are available from Connery Avenue to the project site.

Water supply to the project area is provided by an 6-inch line in Connery Avenue. Typically, 1 1/2-inch service lines are available into the project site. Solid waste is not generated at this site. Stormwater from vacant parking lots runs off the paved areas onto the surrounding grass/wooded area.

Overhead electrical lines are located along Connery Avenue to the south and Frank Perkins Road to the east. This electrical service is a 3-phase, 25 kVA line maintained by MAANG.

A 2-inch natural gas line is available in Chennault Road with 1 1/4 inch capped service lines extending into the site.

Impacts. Potable water will be required to support on-site personnel and the equipment washrack. Water demand currently generated by the MAARNG UTES facility (Section 3.5.4.1) is not expected to increase with the construction of the proposed UTES facility.

The volume of solid waste generation is not expected to increase over current levels. Construction of the UTES facility will generate a temporary increase in solid waste. The former UTES buildings would be demolished and the site cleared to support on-going IRP activities and the historical registration of the adjacent BOMARC facility. This demolition would also generate a temporary increase in solid waste.

Surface water runoff will be generated by the development of approximately 5.6 acres of paved surface and buildings. A storm water drainage system may be constructed for the paved areas discharging surface runoff to the grass/woods surrounding the site. The design of the UTES facility will include the drainage system and discharge outlet. A crushed stone parking lot that will permit the infiltration of rain water will also be constructed for military vehicle storage.

Overhead electrical lines are readily available from which a service connection to the UTES facility can be constructed. This service connection will not impact the surrounding environment. Operation of a new UTES facility is not expected to increase electricity requirements.

Natural gas will be required to provide heating for the multiple structures. Modification of an existing service line or construction of a new service line will not impact the surrounding environment as it will be located alongside an existing roadway.

Mitigation. No mitigation is necessary.

Alternative 3

Existing Conditions. This alternative involves the renovation of the existing UTES facility. The project site is currently developed with an existing maintenance building and military vehicle storage area. Utility services currently provided to the site include potable water, solid waste disposal, storm water electricity, and natural gas.

Water supply to the project area is provided by an 10-inch line in Greenway Road and 10-inch line south of the UTES facility near the BOMARC facility. Smaller service lines are located within the site extending away from the 10-inch water main.

Solid waste generated at the UTES facility is transported to the Upper Cape Regional Transfer Station by contracted waste haulers and then transferred by rail to the SEMASS facility.

Rain water from the parking areas and building is collected in a storm system and discharged to the ground surface south of the UTES facility.

Overhead electrical lines service the area along Greenway Road, providing 3-phase electrical service to Buildings 4600 and 4601, 15 kVA and 100 kVA, respectively. This electrical service is maintained by MAANG and powered by Commonwealth Electric Company. Underground ducts are used to power the security lighting around the facility.

Natural gas is available as it already services the existing UTES facility.

Impacts. Potable water will continue to be provided to the UTES facility to support on-site personnel and the equipment washrack. Water consumption currently generated by the MAARNG UTES facility (Section 3.5.4.1) is not expected to increase with the renovation of the existing UTES facility. The existing 10-inch water mains provide sufficient water pressure and volume to the facility and likely will not require updating.

Solid waste generation is not expected to increase. There will be a short-term increase of solid waste generated at this site during the renovation and construction of ancillary facilities.

Surface water runoff will continue to be generated after the renovation of the existing facility and construction of ancillary facilities. Modifications to the storm system will be determined during the design phase of the UTES facility. Surface water will continue to be discharged to the ground surface south of the UTES facility. A crushed stone parking lot will also be constructed for military vehicle storage permitting the infiltration of rain water.

Overhead electrical lines and service lines are readily available for the renovation of the UTES facility. Electricity demand is not expected to increase.

Mitigation. No mitigation is required.

No Action Alternative

The No Action Alternative will require the continued use of the existing UTES facility and no new construction. Therefore, no impacts are anticipated under this alternative. No mitigation is necessary.

4.9.2.2 Airfield Control Tower

The proposed airfield control tower will require potable water, solid waste disposal, electrical and natural gas services.

Alternative 1

Existing Conditions. This alternative involves the construction of a new control tower between the existing control tower and the FAA building. This project location has open land adjacent to the flightline. Utility services currently provided to the site include potable water, solid waste disposal, electricity, and natural gas.

Potable water is supplied to the project area by an 8-inch line adjacent to the existing control tower and 10-inch line in Reilly Road. There are currently no buildings located in this immediate area.

Solid waste is not generated at this site.

Surface water runoff generated around the control tower is collected in the Eastern Storm Drainage system (SD-4, Section 3.5.4.3) and discharged to the ground surface east of Building 124, where it infiltrates into the ground or passes through an oil/water separator south of Reilly Road.

Buried electrical lines currently provide power to the existing control tower and may be used as a power source for the new Airfield Control Tower. Overhead electrical lines are also located along Reilly Road. This electrical service is a 3-phase, 15 kVA line maintained by MAANG.

Natural gas (4" main) is also available in Reilly Road as a source of fuel for the heating of the proposed control tower.

Impacts. The capacity of the control tower will increase from three personnel to five, with the construction of a new control tower and associated monitoring stations and equipment.

Potable water will be required to support on-site personnel for sanitary purposes. Water demand currently generated by the existing control tower and personnel will increase slightly due to the increase in potential staffing of the control tower. The per capita use of potable water on MMR in 1983 was 94 gpd (James M. Montgomery, 1991), resulting in an average monthly increase of approximately 5,640 gpm. Water is pumped from Well J at an average rate of approximately 9 million gpm (FY 1994). This results in a potential increase of less than 1 percent.

Solid waste generation is not expected to increase. The potential addition of two personnel will not result in measurable increase of the volume of solid waste. Construction of the new facility and demolition of the existing control tower will generate a temporary increase in solid waste.

Buried electrical lines are readily available from which a service connection to the new control tower can be constructed. The control tower cab is proposed to house more modern equipment than currently exists in the existing control tower, along with two additional operating stations. This will generate a slight increase in the amount of electricity used for the operation of the control tower.

Natural gas service will be required to provide heating for the structure. A natural gas service line is located between the existing control tower and the FAA Building from which a service line can be connected. Construction of this service line will not impact the surrounding environment.

Mitigation. No mitigation is necessary. Utility companies have sufficient capacity to accommodate the additional utility needs of two employees.

Alternative 2

Existing Conditions. This alternative involves the construction of a new control tower north of Building 3122. This project location is open land adjacent to the flightline. Utility services currently provided to the site include potable water, solid waste disposal, electricity, and natural gas.

Potable water is supplied to the project area by an 8-inch line along Bradshaw Road. There are currently no buildings located in this immediate area. Three former water service lines are currently stubbed into the project area. These include two 2 1/2-inch water lines and one 1 1/4-inch water line.

Solid waste is not generated at this site.

Storm water is collected from the western portions of the airfield (see Section 3.5.4.3) and discharged to the ground surface near the intersection of Lingley Avenue and Bradshaw Road. Most of this water infiltrates into the ground. During heavy storm events runoff flows to SD-1.

Overhead electrical lines are located along Bradshaw Road. This electrical service is a 3-phase 15 kVA line maintained by MAANG.

Natural gas is also available in Bradshaw Road as a source of fuel for the heating of the proposed control tower. An existing 2-inch service line currently extends into the project area along the northern portion of Building 3107.

Impacts. The capacity of the control tower will increase from three personnel to five, each person with full monitoring stations and equipment.

Potable water will be required to support on-site personnel for sanitary purposes. Water demand is expected to increase approximately 5,640 gpm, compared to the average rate of approximately 9 million gpm (FY 1994) for MMR. This results in a potential increase of less than 1 percent in water consumption.

Solid waste generation is not expected to increase. The potential addition of two personnel will not result in measurable increase of the volume of solid waste. Construction of the new facility and demolition of the existing control tower will generate a temporary increase in solid waste.

Overhead electrical lines are readily available from which a service connection to the new control tower can be constructed. The control tower cab is proposed to house two additional operating stations. This will generate a slight increase in the amount of electricity used for the operation of the control tower.

Natural gas service will be required to provide heating for the structure. The extension of the existing 2-inch service line will not impact the surrounding environment.

Mitigation. No mitigation is necessary.

No Action Alternative

The No Action Alternative will require the continued use of the existing control tower and no new construction. Therefore, no impacts associated with utilities are anticipated under this alternative and no mitigation is necessary.

4.9.2.3 Aircraft Generation Unit Facility

The proposed AGU facility will require potable water, solid waste disposal, electrical and natural gas services.

Alternative 1

Existing Conditions. This alternative involves the construction of a new AGU facility west of Building 158 on the aircraft apron. This area is currently a paved tarmac area and contains existing service lines. Utility services currently provided to the site include potable water, solid waste disposal, electricity, and natural gas.

Potable water is supplied to the project area by a 10-inch line in Reilly Road, and 8-inch water service located between Building 158 and the Hush House.

Solid waste is not generated at this paved site.

Storm water generated at this site is collected in the Eastern Storm Drainage system (SD-4, Section 3.5.4.3) and discharged to the surface east of Building 124, where it infiltrates into the ground or passes through an oil/water separator south of Reilly Road.

Overhead electrical lines are located along Reilly Road. This electrical line is a 3-phase, 15 kVA line maintained by MAANG.

A 4-inch natural gas line is also available in Reilly Road as a source of fuel for the heating of the proposed AGU facility.

Impacts. The number of existing personnel (175) will not increase due to construction of the new facility. Potable water will be required to support on-site personnel; however, an increased demand is not expected to result from the construction of the AGU.

Construction of the new facility will generate a temporary increase in solid waste. Solid waste generation is not expected to increase with the operation of the new AGU facility.

Overhead electrical lines are readily available from which a service connection to the new AGU facility can be constructed. The demand for electrical power is not anticipated to increase.

Natural gas service will be required to provide heating for the structure. Construction of this service line will not impact the surrounding environment.

Mitigation. No mitigation is necessary.

Alternative 2

Existing Conditions. This alternative involves the construction of a new AGU facility at the existing location of Building 163. This building is currently an empty aircraft hangar used for cold storage. Utility services connected to Building 163 include potable water, solid waste disposal, electricity, and natural gas.

A 2-inch water line currently services Building 163, with an 8-inch water main located between Buildings 163 and 156 and an 8-inch main in Izzea Street, east of the site.

Solid waste is not generated at this site.

Storm water generated at this site is collected in the Eastern Storm Drainage system (SD-4, Section 3.5.4.3) and discharged to the surface east of Building 124, where it infiltrates into the ground or is passed through an oil/water separator south of Reilly Road.

Underground electrical lines are currently connected to the abandoned building providing a 3-phase service voltage 25 kVA. A 3-phase 37.5 kVA overhead line is available in Izzea Street.

Buildings along Izzea Street are currently heated by natural gas (4" main) available in Izzea Street.

Impacts. As stated in Alternative 1, the number of personnel will not increase due to construction of the new facility. Potable water will be required to support on-site personnel; however, an increased demand is not expected to result.

Demolition of Building 163 and the construction of the new AGU facility will generate a temporary increase in amount of solid waste. Solid waste generation is not expected to increase during the operation of the AGU facility.

Underground and overhead electrical lines are readily available from which a service connection to the new AGU facility can be constructed. The demand for electrical power is not anticipated to increase. Natural gas service already exists to support the proposed AGU facility.

Mitigation. No mitigation is necessary.

No Action Alternative

The No Action Alternative will involve no new construction and the continued sharing of Building 158 for both major and minor aircraft maintenance. Therefore, no impacts are anticipated with this alternative. No mitigation is necessary.

4.9.2.4 Fire Station

The proposed construction of a new fire station will require potable water, solid waste disposal, electrical and natural gas services.

Alternative 1

Existing Conditions. This alternative involves the construction of a new fire station in the existing location of Building 128, alongside the flightline. This building is currently empty with no on-going activities. Utility services connected to Building 128 include potable water, solid waste disposal, electricity, and natural gas for heating.

An 8-inch water line is located alongside Building 128, with a 10-inch water main located in Reilly Road.

Solid waste is currently not generated at the building structure.

Surface water from the building roof runs onto the paved surface surrounding the structure and collects in the local storm drains referred to as the Eastern Storm Drainage system (SD-4, Section 3.5.4.3) and discharges to the surface east of Building 124, where it infiltrates into the ground or passes through an oil/water separator south of Reilly Road.

Underground electrical lines are currently connected to the abandoned building providing a 3-phase service voltage 15 kVA.

Natural gas service is already connected to Building 128 for the heating of the existing building.

Impacts. The future housing and training capacity of the fire station will not increase beyond the existing 25 personnel. Potable water will be required to support on-site personnel for sanitary purposes. Water demand generated by the existing fire station and personnel is not expected to increase.

Demolition of Building 128, the former fire station and construction of the new facility will generate a temporary increase in amount of solid waste. Solid waste generation is not expected to increase from the new fire station.

Overhead electrical lines are readily available from which a service connection to the new fire station can be constructed. The fire station is proposed to house similar equipment as currently maintained at the existing facility. Additional vehicle bays and training space will be added generating a slight increase in electrical consumption. Building 128 is already serviced by natural gas to support the proposed fire station. A small increase in heating requirements will be incurred from the larger facility.

Mitigation. No mitigation is necessary.

Alternative 2

Existing Conditions. This alternative involves the construction of a new facility west of the airfield where Building 3122 is currently located along Bradshaw Road. This former administrative building is currently vacant and is scheduled for demolition because of its poor condition. Utility services currently located on site or within Bradshaw Road include potable water, storm sewer, electrical, natural gas and sanitary sewer.

An 8-inch water main is located in Bradshaw Road with a 2 1/2-inch service extending into the site.

Solid waste is currently not generated as the facility is vacant.

Surface water from the building roof and parking lot is collected in a storm drainage system and discharged to a surface water body 170 feet east of Building 3122. This runoff infiltrates into the ground or in severe wet conditions flows south towards Ashumet Pond.

Underground electrical service (3-phase, 25 kVA) is available from Bradshaw into the site.

A 2-inch natural gas is located in Bradshaw Road, however, a service connection is not currently provided to the former administrative building.

A 6-inch sanitary sewer line stub is located approximately 120 feet east of Building 3122, immediately north of the parking lot. This sewer main is connected to the Otis WWTP.

Impacts. The future housing and training capacity of the fire station will not increase beyond the existing 25 personnel. However, an additional 2,000 square foot vehicle storage area will be constructed to house the existing fire equipment from Reilly Road with the satellite fire station located in the family housing area. No increased demand is anticipated for potable water or the generation of solid waste and sewer discharge is expected due level personnel staffing and housing. Electrical and natural gas consumption will also be maintained through the combination of the two existing fire stations. Surface water runoff will continue to discharge into the storm water system in Bradshaw Road with no expected increase in flow rate or volume.

Demolition of Building 3122 and the construction of the new fire station will generate a temporary increase in solid waste. The fate of the existing satellite fire station is unknown, but should not adversely effect utility services in the family housing area.

Mitigation. No mitigation is necessary.

Alternative 3

Existing Conditions. This alternative involves the construction of a new fire station in the existing location of Building 126, at the intersection of Reilly Road and Granville Avenue. Utility services connected to this vacant facility include potable water, solid waste disposal, electricity, and natural gas for heating.

An 8-inch water line currently services Building 126. Two other water mains are available, a 6-inch line to the SE and a 10-inch water main located in Reilly Road.

Solid waste is currently not generated at this vacant building.

Surface water from the building roof runs onto the paved surface surrounding the structure and collects in the Eastern Storm Drainage system (SD-4, Section 3.5.4.3) and is discharged to the surface east of Building 124, where it infiltrates into the ground or passes through an oil/water separator south of Reilly Road.

Underground electrical lines are currently connected to the building providing a 3-phase 15 kVA service voltage.

Natural gas is available in Reilly Road with a service line connected to Building 126 for the heating of the existing building.

Impacts. The future housing and training capacity of the fire station will not increase. However, additional vehicle bays and training space will be added. Water demand generated by the existing fire station and personnel is not expected to increase.

Demolition of Building 126, the former fire station, and the construction of the new facility will generate a temporary increase in amount of solid waste. Long-term solid waste generation is not expected to increase.

Overhead electrical lines are readily available from which a service connection to the new fire station can be constructed. The fire station is proposed to house similar equipment as currently maintained at the existing facility. Additional vehicle bays and training space will be added generating a small increase in electrical consumption. Natural gas is readily available at the site to support the proposed fire station. A small increase in heating requirements will be incurred from the larger facility.

Mitigation. No mitigation is necessary.

Alternative 4

Existing Conditions. This alternative requires the construction of an addition to the existing fire station, Building 122, on Reilly Road. Utility services currently serving this facility include potable water, solid waste disposal, electricity, and natural gas for heating.

An 8-inch water line currently services Buildings 122 and a 10-inch water main is located in Reilly Road.

Solid waste generated at the existing fire station includes sanitary waste from housing personnel. Solid waste generated at this facility is transported to the Upper Cape Regional Transfer Station by contracted waste haulers and then transferred by rail to the SEMASS facility.

Surface water from the building roof runs onto the paved surface surrounding the structure and collects in the Eastern Storm Drainage system (SD-4, Section 3.5.4.3) and is discharged to the surface east of Building 124, where it infiltrates into the ground or passes through an oil/water separator south of Reilly Road.

Overhead electrical lines are currently connected to the building providing a 3-phase 15 kVA service voltage.

A natural gas main is located in Reilly Road with a service connection to Building 122 for heating.

Impacts. The future housing and training capacity of the fire station will not increase. However, additional vehicle bays and training space will be added to the existing building structure. Water demand generated by the existing fire station and personnel is not expected to increase.

The construction of the building addition is expected to generate a temporary increase in amount of solid waste. Long-term solid waste generation is not expected to increase.

Electrical service is already provided to the site and should be sufficient to support the proposed building addition. The fire station will continue to house similar equipment as is currently maintained at the fire station. Additional vehicle bays and training space will be added generating a small increase in electrical consumption.

Natural gas service is already available at Building 122. A small increase in heating requirements will be incurred from the larger facility.

Mitigation. No mitigation is necessary.

No Action Alternative

The No Action Alternative will require the continued use of the existing fire station and no construction of a building addition. Therefore, no impacts associated with utilities are anticipated under this alternative and no mitigation is necessary.

4.9.2.5 Environmental Facility

The proposed construction of an environmental facility will require potable water, solid waste disposal, storm water controls, electrical and natural gas services.

Alternative 1

Existing Conditions. This alternative involves the construction of the new Environmental Facility in a vacant area southwest of the Lingley Avenue/East Inner Road Rotary and across from Building 322. Utility services currently provided to the site include potable water, solid waste disposal, electricity, and natural gas.

Potable water is supplied to the project site by a 1 1/2-inch service line and a 6-inch line in East Inner Road. There are currently no buildings located on this site.

No solid waste is currently generated at this open site. There are no storm drainage systems in the general area leaving rainwater to infiltrate into the ground.

Overhead electrical and instrumentation lines are located along East Inner Road. This electrical service is a 3-phase 25 kVA line maintained by MAANG and powered by Commonwealth Electric Company.

Natural gas is also available in East Inner Road as a source of fuel for the heating of the proposed structure. An existing 2-inch main line and 3/4-inch service line currently exist at the project area.

Impacts. The consolidated Environmental Facility will house approximately 30 personnel currently located at several existing facilities on MMR. No increase in personnel is projected.

Potable water will be required to support on-site personnel for sanitary purposes. Water demand is not expected to increase from the relocation of existing staff.

Construction of the new facility will generate a temporary increase in volume of solid waste. Solid waste generation is not expected to increase with the operation of the new Environmental Facility.

Overhead electrical lines are readily available from which a service connection to the facility can be constructed. A small increase in the amount of electricity used for the operation of this facility is anticipated as the buildings that currently house the 30 personnel will still continue to be operated.

Natural gas service will be required to provide heating for the structure. This can be accomplished with the extension of the existing 3/4-inch service line. A small increase in the amount of natural gas used for the operation of the facility is expected as the prior building structures will still continue to be operated.

Mitigation. No mitigation is necessary.

Alternative 2

Existing Conditions. This alternative involves the construction of the new Environmental Facility in a vacant area NE of the Lingley Avenue/East Inner Road Rotary. Utility services currently provided to the site include potable water, solid waste disposal, electricity, and natural gas.

Potable water is supplied to the project site by a 6-inch line in East Inner Road. There are currently no buildings located on this site.

No solid waste is currently generated at this open site. There are no storm drainage systems in the general area leaving rainwater to infiltrate into the ground.

Overhead electrical and instrumentation lines are located along East Inner Road. This electrical service is a 3-phase 25 kVA line maintained by MAANG.

Natural gas is also available in East Inner Road (2-inch line) as a source of fuel for the heating of the proposed structure.

Impacts. The consolidated Environmental Facility will house approximately 30 personnel currently located at several existing facilities on MMR. No increase in personnel is projected.

Potable water will be required to support on-site personnel for sanitary purposes. Water demand is not expected to increase from the relocation of existing staff.

Construction of the new facility will generate a temporary increase in volume of solid waste. Long-term solid waste generation is not expected to increase.

Overhead electrical lines are readily available from which a service connection to the facility can be constructed. A small increase in the amount of electricity used for the operation of this facility is anticipated as the prior building structures will continue to be operated.

Natural gas service will be required to provide heating for the structure. A small increase in the amount of natural gas used for the operation of the facility is expected as the prior building structures will continue to be operated.

Mitigation. No mitigation is required.

No Action Alternative

The No Action Alternative will require the continued use of various buildings within the Cantonment Area and no new construction. Therefore, no impacts associated with utilities are anticipated under this alternative and no mitigation is necessary.

4.10 Transportation

Potential transportation-related impacts for the Range and Cantonment Projects are discussed below.

4.10.1 Range Projects

An analysis of existing and projected utilization was performed for the Range Projects to determine traffic impacts on the key roadways and intersections. For the five Range Projects, no additional employment is generated but slight increases in vehicle traffic may result.

The different orientations of the proposed projects around the impact area in Scenarios 1, 2, and 3 do not generate unique traffic impacts. This is largely because most of the soldiers utilizing the proposed facilities come directly from the Cantonment area. All scenarios for each project are the same with regard to overall site access and projected utilization. As a result, it can be assumed that traffic impacts are identical for various scenarios of particular projects.

The additional vehicle trips generated by each project are summarized in the following sections and in Table 4-9 below.

For the Saturday morning period, an additional 20 passenger vehicles and 30 heavy vehicles are expected during the highest hour in the period as a result of the proposed projects. The additional passenger vehicles will primarily impact Route 28 leading to the Main Gate, and the Bourne and Otis Rotaries (Figure 3-15). The additional heavy vehicles will primarily impact Route 130 leading to the Gibbs Road Gate. Since these additional vehicles are not expected to occur during the Saturday mid-day peak hour, changes in LOS are not expected and peak period congestion levels will not be affected.

For the Friday evening period, an additional 31 passenger vehicles and 46 heavy vehicles are expected during the highest hour in the four-hour period as a result of the proposed projects. The additional passenger vehicles will primarily impact Route 28 leading to the Main Gate, and the Bourne and Otis Rotaries (Figure 3-14). The additional heavy vehicles will primarily impact Route 130 leading to the Gibbs Road Gate. Since these additional vehicles are not expected to occur during the Friday evening peak hour, no changes in LOS are expected and peak period congestion levels will not be affected.

Table 4-9
Additional Demand Generated For Peak Month Of Utilization

Proposed Project	Additional Vehicles for Peak Periods			
	Peak One Hour between 6:00 and 9:00 AM Saturday		Peak One Hour between 6:00 and 10:00 PM Friday	
	POV[a]	Convoy[b]	POV	Convoy
MRFR	-1	-1	-1	-2
MPMR	0	0	0	0
ISBC	1	1	1	2
MOUT-MAC	12	17	19	27
MOUT-CTF	8	13	12	19
Total	**20**	**30**	**31**	**46**

a: Privately owned vehicle ([POV] passenger car, pick-up truck, etc.)
b: Military convoy vehicle (troop carrier, 2.5 ton truck, 5 ton truck, etc.)

Source: VHB, Inc.

In summary, the additional traffic generated by Range Scenarios 1, 2, or 3 does not result in any operational changes in the roadways and intersections serving MMR.

A brief description of existing conditions, potential impacts, and mitigation for each range project is provided below.

4.10.1.1 Modified Record Fire Range

Existing Conditions. Existing M16 weapons qualification training activity currently takes place on several ranges. The existing annual utilization of MMR for M16 weapons training and qualification is about 7,778 soldiers (active and reserve component, trained at Camp Edwards in 1994).

Impacts. For the year 2000, the projected annual utilization of the MRFR is 7,483 soldiers (as determined in Section 2.4). Assuming no change in utilization will occur from 1994 to 2000 if the MRFR were not built, the annual utilization generated by this project is expected to decrease by 295 soldiers (no civilian utilization). This overall decrease is associated with projected force structure reductions and the projected number of M16 rifles in the training population. Based upon the previously stated assumptions, the resulting additional traffic impacts associated with the MRFR are as follows:

1. For the busiest week of the heaviest utilized month of the year (June), two less vehicle trips are generated by the MRFR during the highest hour occurring between 6:00 AM and 9:00 AM on Saturday. Of these, one vehicle can be classified as a heavy vehicle that will enter via Gibbs Road, and the remaining vehicle is a POV that will enter via the Main Gate.

2. Similarly, three less vehicle trips are generated by the MRFR during the highest hour occurring between 6:00 PM and 10:00 PM on Friday. Of these, two vehicles can be classified as heavy vehicles entering via Gibbs Road, and the remaining vehicle enters via the Main Gate.

Mitigation. No mitigation is necessary.

4.10.1.2 Multi-Purpose Machine Gun Transition Range

Existing Conditions. Existing M60 and .50 Caliber Machine Gun weapons training activity takes place on three different ranges. Existing annual utilization of MMR for M60 and .50 Caliber Machine Gun weapons training and qualification was approximately 1022 soldiers in 1994.

Impacts. For the year 2000, the projected annual utilization of the MPMR is 939 soldiers (as determined in Section 2.4). Assuming no change in utilization will occur from 1994 to 2000 if the MPMR were not built, the annual utilization generated by this project is expected to decrease by 83 soldiers (no civilian utilization). Based upon the previously mentioned assumptions, the resulting additional traffic impacts associated with the MPMR are as follows:

1. For the busiest week of the heaviest utilized month of the year (June), no additional vehicle trips are generated by the MPMR during the heaviest hour occurring between 6:00 AM and 9:00 AM on Saturday.

2. Similarly, no additional vehicle trips are generated by the MPMR during the heaviest hour occurring between 6:00 PM and 10:00 PM on Friday.

Mitigation. No mitigation is necessary.

4.10.1.3 Infantry Squad Battle Course

Existing Conditions. Existing live-fire infantry squad training takes place at the IBC facility (off Gibbs Road). In 1994, an estimated 450 soldiers utilized the IBC.

Impacts. For the year 2000, projected annual utilization of the new ISBC facility is 810 soldiers (as determined in Section 2.4). Since the ISBC is designed for weapons not typically found in civilian law enforcement, no use by this group is projected. Assuming no change in utilization will occur from 1994 to 2000 if the ISBC were not built, the additional annual utilization generated by this project is 360 soldiers (no civilian utilization). Based upon the previously mentioned assumptions, the resulting additional traffic impacts associated with the ISBC are as follows:

1. For the busiest week of the heaviest utilized month of the year (June), two additional vehicle trips are generated by the ISBC during the heaviest hour occurring between 6:00 AM and 9:00 AM on Saturday. Of these, one vehicle can be classified as a heavy vehicle that will enter via Gibbs Road, and the remaining vehicle is a POV that will enter via the Main Gate.

2. Similarly, three additional vehicle trips are generated by the ISBC during the heaviest hour occurring between 6:00 PM and 10:00 PM on Friday. Of these, two vehicles can be classified as heavy vehicles entering via Gibbs Road, and the remaining vehicle enters via the Main Gate.

Mitigation. No mitigation is necessary.

4.10.1.4 Military Operations on Urbanized Terrain-Military Assault Course

Existing Conditions. The MOUT-MAC is a live-fire range designed to train individuals or small groups on specific techniques used in urban combat situations.

Impacts. For the year 2000, projected annual utilization of this facility is 3,180 soldiers and 1,673 civilians for a total of 4,853 (as determined in Section 2.4). Existing annual utilization is non-existent since a MOUT-MAC facility does not currently operate at MMR and units must conduct this training elsewhere. Based upon the previously mentioned assumptions, the resulting additional traffic impacts associated with the MOUT-MAC are as follows:

1. For the busiest week of the heaviest utilized month of the year (June), 29 additional vehicle trips are generated by the MOUT-MAC during the heaviest hour occurring between 6:00 AM and 9:00 AM on Saturday. Of these, 17 vehicles can be classified as heavy vehicles that will enter via Gibbs Road, and the remaining 12 vehicles are POVs that will enter via the Main Gate.

2. Similarly, 46 additional vehicle trips are generated by the MOUT-MAC during the heaviest hour occurring between 6:00 PM and 10:00 PM on Friday. Of these, 27 vehicles can be classified as heavy vehicles entering via Gibbs Road, and the remaining 19 vehicles enter via the Main Gate.

Mitigation. No mitigation is necessary.

4.10.1.5 Military Operations on Urbanized Terrain-Collective Training Facility

Existing Conditions. The MOUT-CTF integrates the individual skills learned in the MOUT-MAC course.

Impacts. For the year 2000, projected annual utilization of this facility is 1,800 soldiers and 1,673 civilians for a total of 3,473 (as determined in Section 2.4). A MOUT-MAC facility does not currently operate at MMR and units must conduct this training elsewhere.

Based upon the previously mentioned assumptions, the resulting additional traffic impacts associated with the MOUT-CTF are as follows:

1. For the busiest week of the heaviest utilized month of the year (June), 21 additional vehicle trips are generated by the MOUT-CTF during the heaviest hour occurring between 6:00 AM and 9:00 AM on Saturday. Of these, 13 vehicles can be classified as heavy vehicles entering via Gibbs Road, and the remaining eight vehicles enter via the Main Gate.

2. Similarly, 31 additional vehicle trips are generated by the MOUT-CTF during the heaviest hour occurring between 6:00 PM and 10:00 PM on Friday. Of these, 19 vehicles can be classified as heavy vehicles entering via Gibbs Road, and the remaining 12 vehicles enter via the Main Gate.

Mitigation. No mitigation is necessary.

4.10.1.6 No Action Alternative

Under No Action, there will be no additional traffic generated by MMR. The only traffic increases on adjacent roadways under No Action will be from non-MMR development in the area. The Cape Cod Commission has estimated traffic in the region to grow at a rate of about 2 percent per year for the next 10 years. This rate of growth in background traffic is based on data compiled from over 40 comparable traffic volume counting locations in the region.

4.10.2 Cantonment Projects

For the five Cantonment projects, no additional employment will be generated and therefore no additional traffic is anticipated beyond the typical yearly growth for the region as discussed above. Further, minor differences for various alternatives for each of these projects will have no impact on travel patterns.

4.10.2.1 Unit Training Equipment Site

The three UTES alternatives have no impact on traffic primarily because no additional employment is generated and because the existing and proposed UTES facilities possess identical capabilities. Any shift in traffic patterns resulting from Alternatives 1 and 2 will be minimal and confined to on-base roadways. The No Action Alternative will involve no new construction, and no change in traffic demand.

4.10.2.2 Airfield Control Tower

The two Airfield Control Tower alternatives will have no impact due to the relatively low traffic volume generated by the control tower and also because the proposed sites are in the vicinity of the existing site. The No Action Alternative will involve no new construction and no change in traffic demand.

4.10.2.3 Aircraft Generation Unit Facility

The number of MAANG personnel assigned to the AGU facility (175 full-time) will not increase as a result of this proposed project. Therefore, it can be assumed that no additional traffic is generated by this project, and no change in traffic patterns will result since the proposed sites are adjacent to the existing site. The No Action Alternative will involve no new construction and no change in traffic demand.

4.10.2.4 Fire Station

The number of personnel currently assigned to the fire station (25 full-time per shift) will not change. Therefore, it can be assumed that no additional traffic will be generated by this project, and no change in off-post traffic patterns will result. The No-Action alternative will involve no new fire station, and no change in traffic demand.

4.10.2.5 Environmental Facility

No traffic impacts associated with Alternatives 1 and 2 are expected since no additional traffic is generated and only minor shifts in on-base traffic patterns will result from this project. The No Action Alternative will involve no new construction, and no change in traffic demand.

4.11 Socioeconomics

Potential impacts to population and employment, regional economy, and fiscal contributions are discussed below.

4.11.1 Population and Employment

The anticipated changes in temporary and permanent population and employment induced by the 10 proposed projects are minimal. The Range and Cantonment Projects will result in no change to the full- or part-time base employment; although, a slight (less than 1 percent) increase in utilization of Camp Edwards' ranges would occur. This increase is based on the projected increase of civilian law enforcement use of the MOUT facilities (1,673 mandays). However, because of the trend in downsizing of the nation's military forces, overall projections for use of Camp Edwards in FY 2000, including activities associated with all Range and Cantonment Projects (approximately 244,000 mandays), is approximately 5.8 percent less than the 259,000 manday use in FY 1994. Under No Action, FY 2000 projections are 6.4 percent less than FY 1994 utilization. Increased use of Otis ANGB or other occupant's facilities is not expected to result from implementation of the Range or Cantonment projects.

4.11.2 Environmental Justice

As discussed in Section 3.6.1.3, the only minority and/or low-income populations adjacent to MMR are located east southeast and northwest of MMR. None of these populations fall within areas potentially impacted by the Range or Cantonment Projects; therefore, disproportionately high and adverse human health or environmental effects on minority and/or low-income communities are not expected.

4.11.3 Regional Economy

Since no additional employment or permanent population increase will result from the proposed projects, no change in the demand for housing is anticipated. Any change in business volume or change in demand for local services will originate from the slightly increased transient population at MMR. Since this transient group is comprised mostly of persons involved in intensive field training, time for recreation is assumed to be minimal. The majority of this training population is comprised of soldiers who sleep in the field in tents requiring no permanent billeting. Any on-base purchasing patterns are assumed to be similar to those of the existing transient users. Off-base purchasing will be restricted to only a few additional soldiers who occasionally go off-base for food or entertainment or to purchase supplies from local businesses. The current extent of local purchasing is unknown. Based on the relatively limited increase in utilization, only minimal changes in business volume and demand for local services off-base are anticipated. A short-term increase in the purchase of goods and services is anticipated during construction of the proposed Range and Cantonment projects.

4.11.4 Fiscal Contributions

Since no additional permanent or temporary employment is generated by the 10 proposed projects, no increase in the residential population, on or off base, is expected. Therefore, in terms of additional school children, no impact on schools is expected. Similarly, no change in the need for police or fire protection requirements off base is expected. As a result, no change in municipal expenditures is anticipated as a result of the development of the proposed projects.

4.12 Project-Related Cumulative Impacts

This section summarizes potential cumulative impacts for the ten Range and Cantonment Projects. Because the Cantonment Project alternatives would result in similar environmental and socioeconomic impact, the worst-case alternative for each project was combined with each Range Project Scenario to show a comparison of potential impacts. The following Cantonment Project alternatives were selected for comparative purposes only: UTES Alternative 3; Airfield Control Tower Alternative 2, AGU Alternative 2, Fire Station Alternative 4; and Environmental Facility Alternative 2. Comparisons of Range Project alternative impacts and Cantonment Project alternative impacts are provided in Tables 4-10 and 4-11, respectively.

4.12.1 Air Quality

Existing emission sources and potential impacts from the construction and operation of the proposed Range and Cantonment Projects are evaluated in Section 4.1. Cumulative air quality impacts for each range scenario, including the worst-case Cantonment Project impacts, are provided below.

4.12.1.1 Range Projects

Table 4-12 provides the total number of small arms fired in FY 1994 and associated emissions. Range Scenarios 1, 2, and 3 will result in the same increase in air pollutant emissions at MMR. The type and total number of rounds projected to be fired at all ranges (including the five proposed projects for Scenarios 1, 2, and 3) are presented in Table 4-13. The annual pollutant emissions (lbs/year) are also provided in Table 4-13.

The increase in pollutant emissions from the FY 1994 weapons firing to the projected FY 2000 weapons firing for all ranges are shown in Table 4-14. Table 4-15 provides the total emissions associated with the number of small arms projected to be fired in FY 2000 under the No Action Alternative.

4.12.1.2 Cantonment Projects

The increase in air pollutants (lbs/year) due to the addition of the five Cantonment Projects are presented in Table 4-16. This table is the same as Table 4-7 and provides an estimate of the annual emissions assuming the heating/cooling systems use natural gas and operate 8,760 hours each year (24 hours per day times 365 days per year). All emissions increases are estimated to be less than one TPY. If the No Action Alternative is selected for the five Cantonment Projects, there will be no changes in existing air pollutant emissions.

Table 4-10
Comparison of Range Project Alternative Impacts by Scenario

Resource Issue	MRFR				MPMR				ISBC				MOUT-MAC				MOUT-CTF			
	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action
Air Quality																				
Increase in emissions from constriction activities.	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA
Increase in emissions from project activities.	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Noise																				
Increase in off-post noise from project activities.	N	○	N	NA	N	N	N	NA	N	N	○	NA	N	N	N	NA	N	N	N	NA
Earth Resources																				
Disturbance of soils during grading from range construction	○	*	*	NA	*	*	○	NA	*	*	*	NA	○	○	○	NA	○	○	○	NA
Potential accumulation of metals in soils.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	NA	NA	NA	NA	NA
Water Resources																				
Potential increase in surface water erosion and sedimentation during range construction.	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA	○	○	○	NA
Potential for metals in soils to migrate to groundwater.	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	NA	NA	NA	NA	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

(1) Land use compatibility issues are addressed under Noise.

Table 4-10 (Continued)
Comparison of Range Project Alternative Impacts by Scenario

Resource Issue	MRFR				MPMR				ISBC				MOUT-MAC				MOUT-CTF			
	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action
Biological Resources																				
Loss of vegetation or habitat, or wildlife displacement.	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Loss of sensitive vegetation or habitat, or sensitive species displacement.	N	N	N	NA	*	*	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Impacts to wetland areas.	N	N	N	NA	○	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Land Use																				
Potential changes in on-post land uses.	*	N	N	NA	N	N	*	NA	N	N	N	NA	*	*	*	NA	*	*	*	NA
Adverse effects to off-post land uses[(1)]	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Cultural Resources																				
Loss of prehistoric resources.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	○	○	○	NA
Loss of historic resources.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	○	○	○	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

(1) Land use compatibility issues are addressed under Noise.

Table 4-10 (Continued)
Comparison of Range Project Alternative Impacts by Scenario

Resource Issue	MRFR				MPMR				ISBC				MOUT-MAC				MOUT-CTF			
	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action	1	2	3	No Action
Hazardous Materials and Hazardous Waste Management																				
Increased hazardous waste generation from project activities.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA
Utilities																				
Increased utility demand	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Transportation																				
Project-related traffic increase.	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA	*	*	*	NA
Socioeconomics																				
Short-term increase in local purchased goods and services during construction.	B	B	B	NA	B	B	B	NA	B	B	B	NA	B	B	B	NA	B	B	B	NA
Disproportionately high and adverse human health or environmental effects on minority and/or low-income communities.	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA	N	N	N	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

[1] Land use compatibility issues are addressed under Noise.

Table 4-11
Comparison of Cantonment Project Alternative Impact

Resource Issue	UTES				Airfield Control Tower			AGU			Fire Station					Environmental Facility		
	1	2	3	No Action	1	2	No Action	1	2	No Action	1	2	3	4	No Action	1	2	No Action
Air Quality																		
Increase in emissions from construction activities.	○	○	○	NA	○	○	NA	○	○	NA	○	○	○	○	NA	○	○	NA
Increase in emissions from project activities.	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Noise																		
Increase in off-post noise from project activities.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Earth Resources																		
Disturbance of soils from grading during construction.	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Water Resources																		
Increase in surface water runoff.	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Impacts to groundwater.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

[1] Land use compatibility issues are addressed under Noise.

Table 4-11 (Continued)
Comparison of Cantonment Project Alternative Impact

Resource Issue	UTES				Airfield Control Tower			AGU			Fire Station					Environmental Facility		
	1	2	3	No Action	1	2	No Action	1	2	No Action	1	2	3	4	No Action	1	2	No Action
Biological Resources																		
Loss of vegetation or habitat, or wildlife displacement.	*	*	*	NA	*	N	NA	N	N	NA	N	N	N	*	NA	*	*	NA
Loss of sensitive vegetation or habitat, or sensitive species displacement.	*	N	*	NA	N	N	NA	N	N	NA	N	N	N	N	NA	○	○	NA
Impacts to wetland areas.	○	N	○	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Land Use																		
Potential changes in on-post land uses.	*	*	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	*	*	NA
Adverse effects to off-post land uses[1]	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Cultural Resources																		
Loss of prehistoric resources.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Loss of historic resources.	○	○	○	○	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Hazardous Materials and Hazardous Waste Management																		
Increased hazardous waste generation from project activities.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

[1] Land use compatibility issues are addressed under Noise.

Table 4-11 (Continued)
Comparison of Cantonment Project Alternative Impact

Resource Issue	UTES				Airfield Control Tower			AGU			Fire Station					Environmental Facility		
	1	2	3	No Action	1	2	No Action	1	2	No Action	1	2	3	4	No Action	1	2	No Action
Utilities																		
Increased utility demand	*	*	*	NA	*	*	NA	*	*	NA	*	*	*	*	NA	*	*	NA
Transportation																		
Project-related traffic increase.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA
Socioeconomics																		
Short-term increase in local purchased goods and services during construction.	B	B	B	NA	B	B	NA	B	B	NA	B	B	B	B	NA	B	B	NA
Disproportionately high and adverse human health or environmental effects on minority and/or low-income communities.	N	N	N	NA	N	N	NA	N	N	NA	N	N	N	N	NA	N	N	NA

Notes:

● = Significant impact/Not mitigatible
○ = Significant impact/Mitigatible
* = Less than significant impact

N = No impact
B = Beneficial impact
NA = Not applicable

(1) Land use compatibility issues are addressed under Noise.

Table 4-12
Total Existing Weapons Firing and Associated Air Emissions (FY 1994)

Camp Edwards Ranges	Munitions Type	Number of Rounds Fired	Annual Pollutant Emissions (lbs/year)					
			VOC	NO_x	CO	SO_2	PM	Lead
ALL SMALL ARMS RANGES	5.56 mm	786,509	0.0	0.2	1746.4	5.9	207.0	7.1
	7.62 mm	287,462	0.0	0.2	897.9	16.5	94.0	0.0
	0.50 cal	38,830	0.0	0.2	758.0	1.7	159.0	0.0
	Other (#)	664,557	0.0	0.2	1475.6	5.0	174.9	6.0
Subtotal		**1,777,358**	**0.0**	**0.7**	**4877.9**	**29.3**	**634.8**	**13.0**
ARTILLERY AND MORTAR RANGES	60 mm	259	0.0	0.0	740.3	0.0	0.0	0.0
	81 mm	2,248	0.0	0.0	6,424.9	0.0	0.0	0.0
	4.2 inch	311	0.0	0.0	889.0	0.0	0.0	0.0
	155 mm	363	0.0	8.7	0.0	0.0	0.0	0.0
Subtotal		**3,181**	**0.0**	**8.7**	**8,055.1**	**0.0**	**0.0**	**0.0**
Total			**0.0**	**9.4**	**12,933.0**	**29.3**	**634.8**	**13.0**

# All other small arm rounds. Emissions for Other Small Arms Rounds assumes emission factors calculated for 5.56 mm rounds.

Note: Numbers may not total due to rounding.

Table 4-13
Total Projected Weapons Firing and Associated Air Emissions (FY 2000)

Camp Edwards Ranges	Munitions Type	Number of Rounds Fired	Annual Pollutant Emissions (lbs/year)					
			VOC	NO_x	CO	SO_2	PM	Lead
ALL SMALL ARMS RANGES	5.56 mm	2,569,099	0.0	0.7	5704.5	19.4	676.1	23.1
	7.62 mm	709,611	0.0	0.4	2216.6	41.0	231.9	0.0
	0.50 cal	169,412	0.0	0.8	3306.9	7.5	693.6	0.0
	Other (#)	231,432	0.0	0.1	513.9	1.7	60.9	2.1
Subtotal		**3,679,554**	**0.0**	**1.9**	**11741.9**	**69.7**	**1662.5**	**25.1**
ARTILLERY AND MORTAR RANGES	60 mm	1,007	0.0	0.0	2,878.5	0.0	0.0	0.0
	81 mm	667	0.0	0.0	1,906.6	0.0	0.0	0.0
	120 mm	113	0.0	2.7	0.0	0.0	0.0	0.0
	155 mm	1,304	0.0	31.4	0.0	0.0	0.1	0.0
Subtotal		**3,091**	**0.0**	**34.1**	**4,785.1**	**0.0**	**0.1**	**0.0**
Total			**0.0**	**36.0**	**16,527.0**	**69.7**	**1,662.6**	**25.1**

# All other small arm rounds. Emissions for Other Small Arms Rounds assumes emission factors calculated for 5.56 mm rounds.

Note: Numbers may not total due to rounding.

Table 4-14
Total Air Pollutant Emissions Change from FY 1994 to FY 2000

Camp Edwards Ranges	Munitions Type	Number of Rounds Fired	Annual Pollutant Emissions (lbs/year)					
			VOC	NO_x	CO	SO_2	PM	Lead
ALL SMALL ARMS RANGES	5.56 mm	1,782,590	0.0	0.5	3958.1	13.4	469.1	16.0
	7.62 mm	422,149	0.0	0.2	1318.7	24.4	138.0	0.0
	0.50 cal	130,582	0.0	0.6	2548.9	5.8	534.6	0.0
	Other (#)	-433,125	0.0	-0.1	-961.7	-3.3	-114.0	-3.9
Subtotal		**1,902,196**	**0.0**	**1.2**	**6864.0**	**40.4**	**1027.7**	**12.1**
ARTILLERY AND MORTAR RANGES	60 mm	748	0.0	0.0	2,138.2	0.0	0.0	0.0
	81 mm	-1,581	0.0	0.0	-4,519.2	0.0	0.0	0.0
	120 mm	113	0.0	2.7	0.0	0.0	0.0	0.0
	155 mm	941	0.0	22.7	0.0	0.0	0.1	0.0
	4.2 inch	-311	0.0	0.0	-889.0	0.0	0.0	0.0
Subtotal		**-90**	**0.0**	**25.4**	**-3,270.0**	**0.0**	**0.1**	**0.0**
Total			**0.0**	**26.6**	**3,594.0**	**40.4**	**1,027.8**	**12.1**

# All other small arm rounds. Emissions for Other Small Arms Rounds assumes emission factors calculated for 5.56 mm rounds.

Note: Numbers may not total due to rounding.

Table 4-15
Total Air Pollutant Emissions Change from FY 1994 to FY 2000 Under No Action

Camp Edwards Ranges	Munitions Type	Number of Rounds Fired	Annual Pollutant Emissions (lbs/year)					
			VOC	NO_x	CO	SO_2	PM	Lead
ALL SMALL ARMS RANGES	5.56 mm	685,416	0.0	0.2	1521.9	5.1	180.4	6.2
	7.62 mm	88,030	0.0	<0.1	275.0	5.1	28.8	0.0
	0.50 cal	127,038	0.0	0.6	2479.9	5.6	520.1	0.0
	Other (#)	-437,022	0.0	-0.1	-940.4	-3.3	-115.0	-4.0
Subtotal		**463,462**	**0.0**	**0.7**	**3336.4**	**12.5**	**614.3**	**2.2**
ARTILLERY AND MORTAR RANGES	60 mm	748	0.0	0.0	2,138.2	0.0	0.0	0.0
	81 mm	-1,581	0.0	0.0	-4,519.2	0.0	0.0	0.0
	120 mm	113	0.0	2.7	0.0	0.0	0.0	0.0
	155 mm	941	0.0	22.7	0.0	0.0	0.1	0.0
	4.2 inch	-311	0.0	0.0	-889.0	0.0	0.0	0.0
Subtotal		**-90**	**0.0**	**25.4**	**-3,270.0**	**0.0**	**0.1**	**0.0**
Total			**0.0**	**26.6**	**66.2**	**12.5**	**614.4**	**2.2**

# All other small arm rounds. Emissions for Other Small Arms Rounds assumes emission factors calculated for 5.56 mm rounds.

Note: Numbers may not total due to rounding.

Table 4-16
Estimated Emissions from Proposed Cantonment Area Projects *

Proposed Facility	Annual Pollutant Emissions (lbs/year) +					
	VOC	NO_x	CO	SO_2	PM	Lead
UTES Facility	35.3	924.2	194.1	5.5	110.9	0.0
Airfield Control Tower	9.5	247.0	51.9	1.5	29.6	0.0
AGU Facility	18.7	489.0	102.7	2.9	58.7	0.0
Fire Station	20.1	526.0	110.5	3.2	63.1	0.0
Environmental Facility	12.1	315.0	66.1	1.9	37.8	0.0
Total	**95.7**	**2501.2**	**525.3**	**15.0**	**300.1**	**0.0**

* These emissions will replace similar emissions associated with existing operations. The net project-related emissions will be less than the estimated emissions shown in this table.

+ USEPA Air Pollutant Emission Factors (AP-42) were used to estimate emissions based upon natural gas boiler capacities for facilities. Annual emissions assume boiler operations for 8,760 hours per year.

4.12.1.3 Range and Cantonment Projects

The total net air pollutant emissions change from FY 1994 to FY 2000 associated with the 10 proposed projects is presented in Table 4-17. This table reflects the data required to comply with the Conformity Rule. As discussed in Section 4.1.1.1, a Limited Plan Application will be required to conform with Massachusetts air permitting requirements (310 CMR 7.02).

Table 4-17
Total Estimated Air Pollutant Emissions Change from FY 1994 to FY 2000 *

Source	Annual Pollutant Emissions (lbs/year)					
	VOC	NO_x	CO	SO_2	PM	Lead
Small Arms, and Mortar and Artillery Ranges	0.0	26.6	3,594.0	40.4	1,027.8	12.1
Cantonment Projects +	95.7	2,501.2	525.3	15.0	300.1	0.0
Indirect (Mobile Source) Emissions	10,043.0	10,316.0	56,139.0	4,357.0	1,401.0	98.0
Net Change from Baseline (lbs/year)	10,138.7	12,843.8	60,258.3	4,412.4	2,728.9	110.1
De Minimis Levels (lbs/years)	100,000	100,000	200,000	200,000	200,000	50,000

* Information from this table is based on emissions presented in Tables 4-14, 4-16, and Tables E-27 and E-29 in Appendix E-1.

+ This table does not subtract for emissions associated with buildings the Cantonment Projects will replace; therefore, the net project-related emissions will be less.

Note: This table does not include construction-related emissions.

4.12.1.4 Conformity Rule

Conformity under the CAA, Section 176 has been evaluated for the proposed MMR projects per 40 CFR 51. The General Conformity Rule, "Determining Conformity of General Federal Actions to State or Federal Implementation Plans" became effective on January 31, 1994. The purpose of the rule is to ensure the Federal actions conform to applicable state implementation plans (310 CMR 7.00). Massachusetts has adopted the General Conformity Rule and developed their state implementation plan in 1982.

The General Conformity Rule covers the net increase of mobile and stationary source direct and indirect emission of criteria pollutants and their precursors that are caused by a federal action. Direct emissions are those emissions caused by a federal action and occur at the same time and place as that federal action. Indirect emissions are those emissions caused by a federal action, but may occur later in time and/or may be farther removed in distance from the action itself. The General Conformity Rule only applies to federal actions in non-attainment areas. MMR is located in an area that has been classified as non-attainment (serious) for O_3 and attainment or unclassified for all other criteria pollutants. NOx and VOCs are considered as precursors to the formation of O_3.

As shown in Table 4-17, the net direct and indirect increase in VOC and NOx emissions associated with the 10 proposed projects (10,138.7 pounds [lbs] and 12,843.8 lbs, respectively) is well below the de minimis levels established by 40 CFR 51.853(b). With the exception of a temporary increase in VOCs and NOx during the construction phase of these proposed projects, and a slight increase in vehicle traffic generated as result of the MOUT facilities, no other net increases in indirect emissions are expected to result. These indirect VOC and NOx emissions will not approach de minimis levels.

In summary, the total net direct and indirect increase in VOCs and NOx emissions associated with the 10 proposed projects are clearly below de minimis levels, and therefore this action does not require a conformity determination (Appendix E).

4.12.2 Noise

Impacts to off-post noise are associated with the Range Projects. No noise impacts (other than during construction) are expected to result from the Cantonment Projects. Cumulative impacts associated with the Range Scenarios are discussed below. Increases in off-post noise levels are not expected to result under No Action.

Scenario 1. Zone III and II contours are not expected to extend further beyond the MMR boundary as a result of Range Scenario 1.

Scenario 2. A slight increase in the Zone II area (which currently extends off-post) would result from implementation of Scenario 2. This increase would occur in the vicinity of Snake Pond and Forestdale.

Scenario 3. A slight increase in the Zone III area (which currently extends off-post) would result from implementation of Scenario 3. This increase would occur east of N Range and the MMR boundary. Similar to Scenario 2, a slight increase in the Zone II area would also occur in the vicinity of Snake Pond and Forestdale.

4.12.3 Earth Resources

Impacts to earth resources (topography) are associated with the construction of the Range Projects. No impacts are expected to result from construction or operation of the Cantonment Projects. Some topographic alteration may be necessary to construct ranges in areas where ranges do not currently exist. However, in these instances, ranges would be designed to fit within the existing topographic setting as much as possible to maintain training realism. Those alternative locations that involve the conversion of existing ranges are not expected to require topographic alteration.

Soils impacts are associated with the potential for metals from bullets fired at the proposed ranges to accumulate in soils in and in front of target berms. However, range design can incorporate bullet traps, clay liners under berms, and/or soil additives to prevent migration of metals in these soils.

Impacts to earth resources are not expected to result under No Action.

4.12.4 Water Resources

No impacts to surface water are expected to result from construction or operation of the proposed projects. Proposed access roads and parking areas for the Range Projects will be constructed of either dirt or crushed stone rather than impervious material to minimize surface water runoff. The Cantonment Projects will include both pervious and impervious access roads and parking areas. Stormwater runoff associated with these projects will be addressed prior to construction within the project design.

Project-related impacts to groundwater are not expected to result. However, under No Action, the potential exists for metals in soils from past weapons firing to migrate to the water table. Studies have been conducted to determine this long-term potential impact. In addition, subsequent studies are ongoing to determine what effect, if any, vertical migration of metals will have on the aquifer underlying the Camp Edwards impact area.

4.12.5 Biological Resources

Cumulative project-related impacts to biological resources include loss of vegetation and habitat, potential impacts to wetlands, and potential impacts to state-listed threatened or endangered species. The amount and type of vegetation and habitat loss or alteration is expected to be minimal and will not differ significantly between the three range scenarios.

Under Range Scenario 1, Grassy Pond may be impacted during construction of the MPMR. A small cattail wetland north of the existing UTES facility may be impacted by UTES Alternative 3. UTES Alternative 3 may also impact butterfly weed (*Ascepias tuberosa*), a state watch list species. Less than 0.5 acre of potential upland sandpiper (state endangered) and grasshopper sparrow (state threatened) habitat would be cleared for construction of the Environmental Facility (under either alternative). No other impacts to wetland resources and threatened or endangered plant or animal species are anticipated.

Impacts to biological resources are not expected to result under No Action.

4.12.6 Land Use

No project-related cumulative land use impacts are expected to result from construction or operation of the Range and Cantonment projects. Land use impacts are not expected to result under No Action.

4.12.7 Cultural Resources

Scenario 1. Land with a high potential to contain archeological resources would be impacted during construction and operation of the MOUT-CTF. Although not cumulative, impacts to the existing BOMARC complex may result from the relocation of the existing UTES facility, if the BOMARC complex is determined eligible for nomination to the NRHP. Surveys are ongoing to determine if archeological resources exist within the MOUT-CTF location. Consultation with SHPO has been initiated regarding surveys at the MOUT-CTF location and the BOMARC complex. Consultation will continue and be completed prior to initiating construction activities.

Scenario 2. Land with a high potential to contain archeological resources would be impacted during construction and operation of the MOUT-CTF. Although not cumulative, impacts to the existing BOMARC complex may result from relocation of the existing UTES facility if the BOMARC complex is determined eligible for nomination to the NRHP. Surveys are ongoing to determine if archeological resources exist within the MOUT-CTF location. Consultation with SHPO has been initiated regarding surveys at the MOUT-CTF location and the BOMARC complex. Consultation will continue and be completed prior to initiating construction activities.

Scenario 3. MOUT-CTF would be constructed in an area with a high potential to contain archeological resources. In addition, impacts to the existing BOMARC complex may result from the construction of an addition to the existing UTES facility if the BOMARC complex is determined eligible for nomination to the NRHP. Surveys are ongoing to determine if archeological resources exist within the MOUT-CTF location. Consultation with SHPO has been initiated regarding surveys at the MOUT-CTF location and the BOMARC complex. Consultation will continue and be completed prior to initiating construction activities.

Project-related cumulative impacts to cultural resources are not expected to result under No Action.

4.12.8 Hazardous Materials and Hazardous Waste Management

Project-related cumulative hazardous materials and hazardous waste management impacts are not expected to result from construction or operation of the Range or Cantonment projects, or under No Action.

4.12.9 Utilities

Other than short-term solid waste generation resulting from demolition and construction activities associated with the Range and Cantonment projects, no project-related cumulative utility impacts are expected. Utility impacts are not expected to result under No Action.

4.12.10 Transportation

Based on the historic peak month of Camp Edwards utilization (June), a maximum of 50 additional POV and convoy vehicles will be generated by the Range Projects in the peak hour on Saturday morning (Table 4-9). During Friday evening, a maximum of 77 additional POV and convoy vehicles in the peak hour would result (Table 4-9). These minor increases would not occur during the Saturday midday or Friday evening peak hours for the MMR study area and are projected to be the same regardless of alternative location. No traffic increases are expected to result from the Cantonment Projects. Cumulative impacts are not expected to result under No Action.

4.12.11 Socioeconomics

No project-related cumulative socioeconomic impacts are expected to result from operation of the Range and Cantonment projects. A short-term increase of purchasing goods and services would result during construction. Disproportionately high and adverse human health or environmental effects on minority and/or low-income communities are not expected to result from construction or operation of the Range and Cantonment projects.

4.13 Irreversible and Irretrievable Commitment of Resources

Irreversible and irretrievable resource commitments are related to the use of nonrenewable resources and the effects that the use of these resources will have on future generations. Irreversible effects primarily result from use or destruction of a specific resource (e.g., energy and minerals) that cannot be replaced within a reasonable time frame. Irretrievable resource commitments involve the loss in value of an affected resource that cannot be restored as a result of the action (e.g., extinction of a threatened or endangered species, or the disturbance of a cultural site). The following impacts associated with implementation of the Range and/or Cantonment projects would be irreversible or irretrievable:

- loss of forested or grassland habitat for wildlife (see Section 4.5)
- potential loss of archeological resources due to construction (see Section 4.5).

4.14 Cumulative Impacts

Cumulative impacts, as defined by CEQ, result from "the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time" (CEQ, 1978).

Recent past actions at MMR include construction of a Communications Electronics Training Facility and a Medical Training Facility on Otis ANGB. The communications facility was estimated to add 47 employees to the Otis ANGB population. The medical facility was constructed to house a medical training unit that already existed at Otis ANGB. When considered in combination with the proposed action presented in this EIS/EIR, no significant cumulative environmental or socioeconomic consequences are expected to result. Both projects were subject to MEPA review and were determined by MEPA to have minimal potential for adverse environmental impact, and EIRs were not required (see Appendix B).

Reasonably foreseeable future actions at MMR and the region include a Barnstable County prison, a Massachusetts Steamship Authority ferry parking lot, and a Massachusetts Executive Office of Transportation and Construction rail freight transfer facility. All three of these proposed projects are in the preliminary concept phase and plans have not been publicly formalized. Information to predict potential environmental consequences is not available. These projects, if formalized, will be subject to NEPA and/or MEPA review.

5.0 REFERENCES

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Federal Agencies

Advisory Council on Historic Preservation
National Guard Bureau
U.S. Air Force
U.S. Army Environmental Center
U.S. Coast Guard
U.S. Department of Agriculture
U.S. Department of Health and Human Services
U.S. Environmental Protection Agency, Region I
U.S. Fish and Wildlife Service
U.S. Geologic Survey

State Agencies

California Department of Toxic Substances Control
Executive Office of Environmental Affairs
Massachusetts Air National Guard
Massachusetts Army National Guard
Massachusetts Audubon Society
Massachusetts Department of Environmental Protection

State Agencies (Continued)

Massachusetts Historical Commission
Massachusetts Military Division, Office of the Adjutant General
Massachusetts Military Division, Office of the State Quartermaster
New Hampshire National Guard

Regional/Local Agencies

Barnstable County Assembly of Delegates
Barnstable County Department of Health
Bourne Board of Health
Bourne Town of Selectmen
Bourne Water District
Falmouth Board of Selectmen
Falmouth Chamber of Commerce
Falmouth Department of Public Works
Mashpee Board of Selectmen
Mashpee Chamber of Commerce
Sandwich Board of Health
Sandwich Board of Selectmen

Organizations

Ashumet Holly & Wildlife Sanctuary
Ashumet Valley Property Owners, Inc.
Ashumet-Johns Pond Association
Association for the Preservation of Cape Cod
Barnstable Patriot
Bay Shores Realty
Boston Globe
Boston Herald
Boston Teacher's Union, H&W Fund
Boston University School of Public Health
Bourne Enterprise
Bourne High School
Cape Cod Chamber of Commerce
Cape Cod Community College
Cape Cod Commission
Cape Cod Hospital
Cape Cod Research, Inc.
Cape Cod Times

Organizations (Continued)

Clean Berkshires
Clean Sites
Coalition for Buzzards Bay
Coonamessett Pond Association
Cotuit Library
Decoy Realty
Falmouth Airpark
Falmouth Enterprise
Falmouth MMR Task Force
Mashpee-Briarwood Association
Massachusetts Maritime Academy
Massachusetts Institute of Technology
North Falmouth Realty
Otis Civilian Advisory Council
Otis Conversion Project
Otis Notice
R.E.P.S
Sand Shores Realty
Sierra Club, Cape Cod Group
Sturgis Library
Teaticket Civic Association
The Register
Watertown Health Action Projects
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WN Chase Realty
WOCN
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WXTK

APPENDIX A

CONSENT DECREE

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UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

CONSERVATION LAW FOUNDATION OF NEW ENGLAND, INC. Plaintiff,	Civil Action
v.	No. 86-1044-S
LT. GENERAL HERBERT R. TEMPLE, JR., as he is CHIEF OF THE NATIONAL GUARD BUREAU, *et al*., Defendants.	

JOINT MOTION TO ADOPT CONSENT DECREE

Conservation Law Foundation of New England, Inc. ("CLF") moves that this Court enter judgment in this matter in accordance with the terms and conditions of the attached Decree, which has been consented to by all the parties. The proposed Consent Decree which provides for this Court to retain jurisdiction until its terms are satisfied fully disposes of all issues raised in these proceedings with the exception of CLF's attorneys' fees and costs for which the plaintiff will petition the Court separately.

Counsel for the federal and state defendants have authorized the undersigned to represent to the Court that they join in this motion.

Respectfully submitted

CONSERVATION LAW FOUNDATION
OF NEW ENGLAND, INC.

By its attorney:

Peter Shelley

Peter Shelley
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Boston, MA 02108
(617) 742 - 2540

CERTIFICATE OF SERVICE

I hereby certify that a true copy of the above document was served upon the attorney of record for each party by mail on September 29, 1989.

Peter Shelley

Peter Shelley

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

CONSERVATION LAW FOUNDATION OF NEW ENGLAND, INC. Plaintiff,	
v.	
LT. GENERAL HERBERT R. TEMPLE, JR., as he is CHIEF OF THE NATIONAL GUARD BUREAU, *et al.*, Defendants.	Civil Action No. 86-1044-S

CONSENT DECREE

WHEREAS, the plaintiff, Conservation Law Foundation of New England, Inc. ("CLF"), has filed an amended complaint alleging in Counts 1 and 2 that Lt. General Herbert Temple, Major General Wayne Wagner,[1] Major General Myrle Langley, and the United States Department of the Air Force are in violation of section 102(2)(c) of the National Environmental Policy Act of 1969, 42 U.S.C. § 4332(2)(c) ("NEPA"), and Section 706 of the Administrative

---

[1] Major General Wayne Wagner has replaced Major General Anthony C. Spadorcia as the Adjutant General of the Massachusetts National Guard and, therefore, is substituted as a party defendant in this action pursuant to Fed. R. Civ. P. 25(d).

Procedure Act, 5 U.S.C. § 706 ("APA"), in connection with the their failure to produce an environmental impact statement or statements for the actions contemplated in the Camp Edwards Master Plan and the Otis Air National Guard Base Fighter Upgrade proposals on the Massachusetts Military Reservation ("MMR") on Cape Cod; and

WHEREAS, in that same complaint, CLF has alleged in Count 3 that defendants Temple, Langley, and the Department of the Air Force are in violation of Subtitle D and Section 6004 of the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6941-6949 & § 6964 ("RCRA"), and EPA landfill regulations implementing RCRA set forth at 40 C.F.R. § 241.204 in their continuing operation of the base landfill located on the Otis Air Force Base ("Otis AFB"); and

WHEREAS, by Count 4 contained in an Amended Complaint filed by CLF in this matter, CLF has alleged that Defendants were in violation of RCRA and its implementing regulations by reason of the ongoing destruction of unused propellants charges at Camp Edwards in connection with artillery training exercises; and

WHEREAS, all defendants deny each and every allegation of statutory and regulatory violation; and

WHEREAS, the parties agree, without adjudication of facts or law, that settlement of CLF's complaint consistent with the terms of this consent decree is in the public interest and that entry of this decree without further litigation is an appropriate way to resolve the dispute, and the parties consent to the jurisdiction of this Court and the entry of this decree;

NOW, THEREFORE, it is hereby Ordered, Adjudged, and Decreed as follows:

I. STATEMENT OF CLAIM

1. The Complaint filed herein states claims upon which relief can be granted against the defendants pursuant to 42 U.S.C. § 4332 (NEPA), 5 U.S.C. § 706 (APA), and 42 U.S.C. §§ 6941-6949 & 6964 (RCRA).

II. JURISDICTION AND VENUE

2. This Court has personal jurisdiction over the parties to this decree. The Court also has jurisdiction over the subject matter of this action and may lawfully enter this consent decree. This District is the proper venue for this action pursuant to 28 U.S.C. § 1391(e) and 42 U.S.C. § 6972 (venue for citizens suits under RCRA).

III. APPLICABILITY

3. The provisions of this decree shall apply to and be binding upon the parties to this action, their officers, agents, and successors in office, and all persons having notice of this decree and acting in active concert and participation with a party.

4. This Court shall have continuing jurisdiction over this matter until such time as all conditions specified in this decree are met by the federal defendants and the Court has terminated the decree pursuant to the procedure set forth in Paragraph 19 below.

IV. COMPLIANCE PROGRAM AND SCHEDULES

5. With the actions identified below in Paragraph 7 excepted, no significant or substantial new construction or facility rehabilitation programs shall be undertaken by or on behalf of the National Guard Bureau, the Massachusetts National Guard (including both Army National Guard and Air National Guard components) or the Department of Defense on Camp Edwards or at Otis Air National Guard Base (hereinafter "Otis ANGB") where such new construction or rehabilitation is within the scope of the Camp Edwards/Massachusetts Military Reservation ("MMR") Master Plan or the Otis ANGB/102d Fighter Interceptor Wing upgrade proposal as documented here-to-date, until such proposals and programs have been analyzed in a MMR Environmental Impact Statement ("EIS") prepared under the provisions of NEPA.

6. Said Massachusetts Military Reservation EIS shall include but not be limited to analysis of the following issues:

a. All appropriate items identified for analysis in scoping sessions held by the National Guard Bureau as required by NEPA and its implementing regulations. Items specified in the scope of work issued by the MEPA Office of the Massachusetts Executive Office of Environmental Affairs dated January 10, 1986, prepared for Major General Wagner for Camp Edwards pursuant to the Massachusetts Environmental Policy Act, G.L. c. 30a, §§ 61 - 62H ("MEPA") shall be considered as matters identified for analysis under NEPA and its implementing regulations. This provision does not constitute admission or agreement by the federal defendants that they are subject to the provisions of MEPA.

b. The need for comprehensive on-site (or off-site near vicinity) ambient air quality monitoring for the entire MMR for the following air pollutants -- nitrogen oxides, sulfur oxides, aromatic hydrocarbon compounds, solvents, and asbestos -- will be analyzed in the Camp Edwards EIS.

c. Cumulative noise evaluations of all military and civilian contract activities at MMR. Noise isopleths shall be calculated to 65 dB and shall be modeled on a scientifically appropriate basis. The need for permanent on-site and off-site noise monitoring stations will be analyzed.

d. The impact of study and remediation of past contamination at the MMR upon proposed or planned construction activities at MMR and the impact of proposed or planned construction on the study and remediation of past contamination at MMR. This provision is not intended to, nor shall it in any manner, subject any action or activity undertaken pursuant to the Comprehensive Environmental Response, Compensation and Liability Act ("CERCLA") to the requirements of NEPA.

e. The need for and availability of resources relating to asbestos removal from existing structures at MMR and the impact of shortfalls in asbestos removal resources.

7. Provided the defendants comply with the provisions of this consent decree in a timely manner, the following programs may go forward notwithstanding the provisions of Paragraph 5 hereof:

a. The upgrade proposal for the 102nd Fighter Interceptor Wing as specifically described in the environmental assessment produced by the National Guard Bureau in January 1987.

b. Activities and remedial programs developed or implemented pursuant to the Department of Defense Environmental Restoration Program ("DoD ERP") or otherwise required to remediate environmental contamination at MMR.

c. Routine maintenance.

d. Massachusetts Army Guard projects identified below:

i. Modification of the UTES site without hazardous waste storage facility. (Master Plan p. 108)

ii. B - C Range and D - E Range Rehabilitation, provided such rehabilitation allows no change in existing utilization of said ranges (Master Plan p. 50).

iii. Leadership Reaction Course (Master Plan p. 74).

iv. Demolition of 3500 and 3600 Blocks (Master Plan pp. 104 - 105).

e. Any actions expressly required to carry out the terms of this decree.

8. Defendants National Guard Bureau and Temple shall develop and maintain noise abatement takeoff, landing and close pattern procedures for all aircraft assigned to the Otis ANGB that minimize the occurrence of off-base noise to the maximum extent practicable and shall incorporate these procedures into the standard operating flight procedures at Otis AFB, subject to

necessary deviations for purposes of pilot safety or defense responsibilities. Any deviations from such standard procedures shall be logged by appropriate personnel at Otis AFB, which log shall be available to the public upon reasonable request. Such noise procedures shall be maintained for a period of not less than two years from the date of entry of this decree.

9. All federal and state agencies using portions of the MMR for regular operations shall establish immediately a unified environmental planning function for the MMR with designated lead agencies if appropriate. Such planning function shall be responsible for integrating and evaluating all proposed government activities at the MMR for purposes of overall environmental planning and shall continue to function for a period of not less than five years from the date of entry of this decree. Such centralized planning function shall also establish a point of contact who shall be responsible for receiving complaints from members of the surrounding communities and providing timely responses to the complainant.

10. SEWAGE TREATMENT PLANT

a. Effective immediately and continuing until such time as the treatment capacity has been upgraded in full accordance with federal and state law, the average daily flow through the Otis ANGB sewage treatment facility shall be limited to 300,000 gallons per day ("gpd") as calculated using the method set out in paragraph 10b below. Daily peak flows shall be limited to 500,000 gpd as calculated using the method set out in paragraph

10b below. No new facilities shall be constructed nor shall new activities be established on MMR nor shall any new sources of sewage or industrial wastewaters be tied into the sewerage system that will have the effect of increasing average or peak sewage flows or increasing the strength or constituents in the effluent from the sewage treatment plant until such time as the treatment capacity of the treatment plant has been upgraded.

b. For purposes of paragraph 10a above, average daily flow from the Otis ANGB sewage treatment facility shall be calculated daily on an annualized basis by averaging daily flow over the period beginning 364 days prior to the day for which the calculation is to be made and ending on the day for which the calculation is to be made. Since repairs have been made to the Parshall flume measuring the output from the sewage treatment plant and, thus, present flow figures are not directly comparable to prior figures, the flows to be averaged shall begin on June 1, 1988.

11. BASE LANDFILL

a. Within sixty days from the date this decree is entered, defendants shall bring the operation of the landfill into compliance with state landfill operating regulations, set forth at Mass. G.L. c. 111 § 150(a) and 310 C.M.R. § 19.00, including, but not limited to, compliance with all interim cover requirements set out in 310 CMR §19.25 in the active operating area of the landfill.

b. On or before December 31, 1989, Defendants shall submit to CLF and the Massachusetts Department of Environmental Protection a permanent closure plan for the formerly active portions of the base landfill which meets the requirements of federal and state law and regulations, specifically Massachusetts G.L. c. 111 § 150(a) and 310 C.M.R. § 19.00.

c. Defendants shall immediately commence and continue for a period of two years from the date of entry of this decree a quarterly groundwater monitoring program both on-site and downgradient of the base landfill. Said monitoring shall provide groundwater samples at various horizons down to the highest impermeable layer. Samples will be tested for the following pollutants:

Field Sampling

temperature, pH, specific conductance;

Laboratory Testing for Well Samples

Metals: arsenic, barium, cadmium, chromium, copper, cyanide, fluoride, iron, lead, manganese, mercury, selenium, silver;

Pesticides: All pesticides assigned maximum contaminant levels under the Safe Drinking Water Act, 42 U.S.C. §§ 300f et seq., including endrin, lindane, methoxychlor, 2,4 - D, 2,4, 5 - TP (Silvex); Oil and grease

Non-organic compounds: chloride, nitrates, nitrite, sodium, sulfate (SO_4);

Semi-volatile and non-volatile organics: base and acid neutral compounds, analyzed by EPA method No. 625.

Volatile organic compounds: Use one of the EPA approved tests recommended in Safe Drinking Water Act.

12. UNDERGROUND STORAGE TANK LEAK DETECTION & MONITORING

a. Within ninety days of the date this decree is entered, defendants shall develop and implement a leak detection inspection and monitoring program which complies with 40 C.F.R. § 280.1 et seq. and all requirements of Massachusetts G.L. c. 148 § 37. This program shall apply to all existing and any newly replaced storage tanks located on the MMR.

b. Within one hundred twenty (120) days of the date this decree is entered, defendants shall develop and commence implemention of a rehabilitation program for the existing underground storage tanks on the MMR that requires:

i. Identification of all underground fuel tankage and piping and inventory of the contents of such tanks.

ii. Removal or repair of all problem tanks. Tanks which have been identified as leaking, or for which there is an objectively demonstrable potential for leakage, such as the presence of excessive corrosion within or upon the tank, shall be immediately drained of all product until repaired or abandoned. If said tanks are abandoned, they shall be removed in compliance with all applicable federal and Massachusetts requirements. If said tanks are repaired, they shall be repaired to new tank standards.

iii. Testing and inventory control procedures in accordance with current Massachusetts regulations for underground petroleum storage tanks.

13. Propellant Burn Containment Vessels

a. On or before the next date of artillery training at Camp Edwards, defendants shall install containment vessels that shall be adequate to contain all propellant for artillery and mortars burned during training operations at MMR. No propellant shall be burned at MMR outside of these containment vessels without a proper federal and state waste disposal permit. These vessels will be designed to prevent the ash from the propellant burning from remaining in contact with the soil and from leaching into the soil. For a period of two years after entry of this decree, ash will be periodically tested for hazardous constituents and any ash determined to be hazardous waste will be disposed of in accordance with applicable state and federal regulations.

V. REPORTING

14. On or before the last business day of each second calendar month following the calendar month in which this decree is entered, and continuing until termination of this decree, the federal and state defendants shall submit in writing to the Court and CLF a report detailing the status and progress of projects under this decree. This report shall contain a description of the compliance or noncompliance with the schedules set forth in section IV above, and a projection of the work to be performed

pursuant to section IV during the four month period to follow. Where there is noncompliance with a schedule set forth in section IV, the report shall include a statement of any corrective action taken or to be taken.

VI. FORCE MAJEURE

15. In the event that defendants are prevented from complying with any of the obligations of this decree on the date specified herein due to acts of God, the unavailability of appropriated funds, or other unforeseeable circumstances beyond their control, defendants shall be relieved of their obligations hereunder up to an equivalent period of the period of delay, provided that the defendants notify the Court and CLF as soon as they become aware that a deadline will be missed due to forces beyond their control and that the defendants take all mitigating measures feasible to minimize the duration of noncompliance with a deadline. Actions of any contractors hired by defendants to accomplish any of the tasks specified herein shall be presumed to be subject to the control of defendants.

VIII. NON-WAIVER PROVISION

16. This decree shall have the effect of res judicata between the parties as to all matters contained herein and as to all matters reasonably encompassed by the complaint in this matter, as amended. This decree in no way affects the duty of defendants to comply with federal, state, and local laws, regulations, or requirements, nor does this decree in any way bind, affect, or limit the authority of the United States Environmental Protection

Agency under CERCLA or any other applicable law.

IX. SEVERABILITY

17. The provisions of this decree shall be severable and should any provision be declared by a court of competent jurisdiction to be inconsistent with federal law, and therefore unenforceable, the remaining provisions of this decree shall remain in full force and effect.

X. RETENTION OF JURISDICTION

18. The Court shall retain jurisdiction to enforce, including by contempt order, the terms and conditions of this decree, to make modifications necessary to effectuate compliance with NEPA, the APA, and RCRA, this decree, applicable permits, laws of the Commonwealth, and any applicable federal or state regulations, and to resolve all disputes arising hereunder as may be necessary or appropriate for the construction and execution of this decree.

XI. TERMINATION OF DECREE

19. When the federal and state defendants have completed all tasks specified herein and have achieved compliance with all requirements of this decree, then any party may move for termination of this decree.

The Court finds that this decree is a reasonable and fair settlement and adequately protects the public interest in accordance with the laws of the United States and the Commonwealth of Massachusetts.

SO ORDERED.

Judgment is hereby entered in accordance with the foregoing consent decree this ______ day of _________________, 1989.

____
Walter Jay Skinner
United States District Judge

Consented To:

FOR CONSERVATION LAW FOUNDATION OF NEW ENGLAND, INC.

Peter Shelley Date: September 29, 1989

Peter Shelley
Conservation Law Foundation
Three Joy Street
Boston, MA 02108

FOR THE UNITED STATES OF AMERICA:

Richard B. Stewart
Assistant Attorney General
Land and Natural Resources Division
United States Department of Justice

J. Steven Rogers Date: 11 September 89

J. Steven Rogers
Division Counsel
Land and Natural Resources Division
Environmental Defense Section
United States Department of Justice

FOR THE MASSACHUSETTS NATIONAL GUARD:

Wayne F Wagner Date: 26 Sept 89

Wayne F. Wagner
The Adjutant General

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APPENDIX B

MEPA DOCUMENTATION - MAANG COMMUNICATIONS AND MEDICAL FACILITIES

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The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, 02202

WILLIAM F. WELD
GOVERNOR

ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR

TRUDY COXE
SECRETARY

Tel: (617) 727-9800
Fax: (617) 727-2754

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME	: Communications Electronics Training Center
PROJECT LOCATION	: Bourne, Falmouth, Sandwich, Mashpee
EOEA NUMBER	: 9520
PROJECT PROPONENT	: Massachusetts Air National Guard
DATE NOTICED IN MONITOR	: July 23, 1993

Pursuant to the Massachusetts Environmental Policy Act (G. L. c. 30, s. 61-62H) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that the above project does not require the preparation of an Environmental Impact Report.

This project involves the construction and operation of a 30,000 square foot training/administration building and a 17,900 square foot building for storage and vehicle/equipment repair and the rehabilitation of two existing buildings including the addition of 1,500 square feet to one for vehicle maintenance and refueling.

The project was previously reviewed (EOEA# 8316) at a location in Stow, Massachusetts. The current project is to be located on the Otis Air National Guard Base (ANGB) on Cape Cod.

I find that this project has minimal potential for adverse environmental impact and, consequently, no EIR is required. The project will generate minimal traffic with 47 employees and will generate little additional sewage (705 gallons per day). These numbers increase on one weekend per month during training sessions and for two weeks in the summer but they are still within acceptable levels.

Several commentors have argued that this project should not be allowed to proceed prior to the filing of the EIR for the Camp Edwards Master Plan, since that Master Plan will consider all activities on "the base." I note that the Otis ANGB (which is operated by the Air Force) is not part of Camp Edwards (operated by the Massachusetts Army National Guard). The Master Plan will not govern activities at the ANGB, although it will take such activities into account as background information. Under these circumstances, it is not appropriate to delay the proposed project until the Master Plan EIR is completed. Projects that are within the scope of the Master Plan, however, may not proceed until the EIR has been certified as adequate.

While I understand the concern with the long delay the development of the Master Plan has experienced, I also note that a revised scope, following a Notice of Project Change, was issued only recently. I expect the EIR will, in accordance with that scope and in conjunction with other investigations (in particular the Installation Restoration Program regarding hazardous waste issues), fully address the environmental impacts from activities at Camp Edwards, and consider activities on the adjacent ANGB, as well.

September 9, 1993
Date

, Asst. Secretary
for Trudy Coxe, Secretary

Comments received : Cape Cod Commission
Falmouth Selectmen
DEP - DWPC
Coastal Zone Management
APCC
Richard Hugus
Susan Walker
Keith Smith
James Kinney

TC/rf

The Commonwealth of Massachusetts
Executive Office of Environmental Affairs
100 Cambridge Street, Boston, 02202

Tel: (617) 727-9800
Fax: (617) 727-2754

WILLIAM F. WELD
GOVERNOR

ARGEO PAUL CELLUCCI
LIEUTENANT GOVERNOR

TRUDY COXE
SECRETARY

SEP 1993
RECEIVED

CERTIFICATE OF THE SECRETARY OF ENVIRONMENTAL AFFAIRS ON THE ENVIRONMENTAL NOTIFICATION FORM

PROJECT NAME : Medical Training Facility
PROJECT LOCATION : Bourne, Falmouth, Sandwich, Mashpee
EOEA NUMBER : 9498
PROJECT PROPONENT : Massachusetts Air National Guard
DATE NOTICED IN MONITOR : July 23, 1993

Pursuant to the Massachusetts Environmental Policy Act (G. L. c. 30, s. 61-62H) and Section 11.06 of the MEPA regulations (301 CMR 11.00), I hereby determine that the above project does not require the preparation of an Environmental Impact Report.

This project involves the construction of a new 10,379 square foot building to house a medical training unit that currently occupies another location on Otis Air National Guard Base. The site specific impacts from the proposed project are minimal and, since the facility already operates on the base, there are no off-site changes.

Several commentors have argued that this project should not be allowed to proceed prior to the filing of the EIR for the Camp Edwards Master Plan, since that Master Plan will consider all activities on "the base." I note that the Otis ANGB (which is operated by the Air Force) is not part of Camp Edwards (operated by the Massachusetts Army National Guard). The Master Plan will not govern activities at the ANGB, although it will take such activities into account as background information. Under these circumstances, it is not appropriate to delay the proposed project until the Master Plan EIR is completed. Projects that are within the scope of the Master Plan, however, may not proceed until the EIR has been certified as adequate.

While I understand the concern with the long delay the development of the Master Plan has experienced, I also note that a revised scope, following a Notice of Project Change, was issued only recently. I expect the EIR will, in accordance with that scope and in conjunction with other investigations (in particular the Installation Restoration Program regarding hazardous waste issues), fully address the environmental impacts from activities at Camp Edwards, and consider activities on the adjacent ANGB, as well.

September 9, 1993
Date

, Asst. Secretary
for Trudy Coxe, Secretary

Comments received : Cape Cod Commission
MCZM
APCC
James Kinney
Keith Smith
Susan Walker
Richard Hugus

TC/rf

UNITED STATES DISTRICT COURT
DISTRICT OF MASSACHUSETTS

CONSERVATION LAW FOUNDATION of NEW ENGLAND, INC., Plaintiff,	Civil Action
VS:	No. 86-1004-S
Lt. GENERAL HERBERT R. TEMPLE, JR., as he is the CHIEF OF THE NATIONAL GUARD BUREAU, et al., Defendant.	

STIPULATION

In September 1989 a consent decree was entered in this action which provided, among other things, that:

> no significant or substantial new construction or facility rehabilitation programs shall be undertaken [at Camp Edwards or Otis Air National Guard Base] where such new construction or rehabilitation is within the scope of the Camp Edwards/Massachusetts Military Reservation ... Master Plan or the Otis ANGB/102d Fighter Interceptor Wing upgrade proposal as documented here-to-date, until such proposals and programs have been analyzed in a MMR Environmental Impact Statement ("EIS") prepared under the provisions of NEPA.

Defendants are now planning to construct a new medical training facility on the property in addition to facilities for the relocation of the Headquarters 253 Combat Communication Group National Guard Base.

An Environmental Assessment has been conducted on both projects, with a finding of no significant impact.

The Executive Office of Environmental Affairs of the Commonwealth of Massachusetts has reviewed the proposals, pursuant to the Massachusetts Environmental Policy Act, and determined that the projects will have minimal environmental impact and do not require the preparation of an Environmental Impact Report.

The parties to this action agree that the projects described above are not inconsistent with the consent decree entered herein and may go forward at this time.

Furthermore, the parties agree that the Environmental Impact Statement referred to above will be announced in June 1994 and scoping meetings will be scheduled for September 1994. Thereafter, defendants will make every effort to complete the EIS within a reasonable time.

APPENDIX C

CONSULTATION AND COORDINATION

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THE COMMONWEALTH OF MASSACHUSETTS
MILITARY DIVISION
THE ADJUTANT GENERAL'S OFFICE
CAMP CURTIS GUILD
HAVERHILL STREET, READING, MA 01867-1999

In reply refer to
MAAR-AG

28 August 1996

SUBJECT: Request for Time Extension to the Filing of the Draft Environmental Impact Report for the Massachusetts Military Reservation Master Plan, EOEA Number 5834

Ms. Trudy Coxe
Secretary of Environmental Affairs
Executive Office of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, Massachusetts 02204

Dear Ms. Coxe,

The Deputy Undersecretary of Defense for Environmental Security, Ms. Sherri Wasserman-Goodman, has committed to conducting an Impact Area Groundwater Study at the Camp Edwards Training Site, Massachusetts Military Reservation, Cape Cod. The focus of this study is to determine the effects of range training operations on the groundwater beneath the impact area.

Based on the above, the Massachusetts Military Division requests an extension from your office for release of the *Draft* Environmental Impact Report to the public until the end of November 1996. This extension is needed in order to complete a series of internal staffing, reviews, and revisions with National Guard Bureau and Department of the Army due to the commitment of the Impact Area Groundwater Study.

I appreciate your understanding in this matter. Should your staff have any technical questions on this issue please contact Mr. Shaun Cody at (617) 944-0500, extension 2541, or Captain Tracy Norris at extension 2540. If you have any questions please contact me.

Sincerely,

Raymond A. Vezina
RAYMOND A. VEZINA
Major General, MAARNG
The Adjutant General

THE COMMONWEALTH OF MASSACHUSETTS
MILITARY DIVISION
THE ADJUTANT GENERAL'S OFFICE
CAMP CURTIS GUILD
HAVERHILL STREET, READING, MA 01867-1999

In reply refer to

31 August 1995

MAAR-AG

SUBJECT: Request for Time Extension to the Filing of the Draft Environmental Impact Report for the Massachusetts Military Reservation Master Plan, EOEA Number 5834

Ms. Trudy Coxe
Secretary of Environmental Affairs
Executive Office of Environmental Affairs
100 Cambridge Street, 20th Floor
Boston, Massachusetts 02204

Dear Ms. Coxe,

In an effort to develop a responsive and thorough Environmental Impact Report (EIR), the Massachusetts Military Division (MMD) has identified the need for additional data collection and analysis regarding the proposed range projects, archeological resources, traffic, and socioeconomic resources. Data collection, field work, and associated analysis for inclusion in the EIR requires an extension to the 40-week schedule referenced in the Secretary of Environmental Affairs' 8 December 1994 Certificate on the Notice of Project Change.

The Massachusetts Military Division anticipates the need for 12 additional months to collect and analyze this data, complete preparation and staff the Draft EIR. The requirement to study the impact area in the 1994 certificate prompted research on how this was to be accomplished as there was no existing guidance. This required coordination between the National Guard Bureau and the Department of the Army. The U.S. Army Training Support Center has agreed to assist us in addressing this issue. Therefore, we respectfully request that the Executive Office of Environmental Affairs grant this extension for the filing of a Draft EIR.

The additional data and analysis are as follows:

1. The U.S. Army Training Support Center and the Army Environmental Center are developing a protocol to conduct a limited study of the proposed range impact areas. The goal of the study would be to a) determine the potential for heavy metal vertical migration from the ranges that might impact the unconfined aquifer and b) determine best available pollution prevention technologies and best management practices which could be

incorporated into new range designs, if the potential for migration is confirmed. Results of this analysis shall be incorporated into the EIR.

The analysis will also involve the compilation of data from the Bourne Future Water Supply monitoring wells, Installation Restoration Program groundwater monitoring wells, data from site investigations of impact areas on other Army installations, and data being developed by the Corps of Engineers Waterways Experiment Station (WES) on chemical and physical factors affecting corrosion and migration of heavy metals in soils.

In addition, during the month of October 1995, WES is tentatively scheduled to be on the MMR to conduct soil boring samples down to approximately 90 feet. The core samples will determine depth of heavy metal migration associated with small arms ranges. The results of the analysis should be received in December 1995. Mitigation measures will be designed into the proposed range designs to minimize vertical migration of heavy metals as appropriate.

2. In 1989, a Cultural Resource Reconnaissance of Camp Edwards Training Site was conducted to provide preliminary baseline archeological information. The goal of this reconnaissance was to stratify the Training Site into zones of expected archeological sensitivity. It was also designed to locate historic and archeological resources within Camp Edwards. The information gathered during the survey was to be used to make recommendations for future studies at the intensive survey level. MMD intends to continue this survey to this next step and conduct the necessary investigations to more completely describe the existing archaeological conditions with regards to the proposed actions.

3. Since seasonal traffic conditions on Cape Cod are a public concern, MMD is currently in the process of collecting the necessary traffic and transportation-related data to describe the existing baseline traffic conditions and potential project-related traffic impacts proximate to Massachusetts Military Reservation (MMR).

4. To date a detailed study of MMR's socioeconomic affects on the surrounding communities has not been conducted. As a result, MMD is currently collecting the necessary data to provide a socioeconomic description and impact analysis of MMR and the Upper Cape for the EIR.

After this data is incorporated into the document, the Federal staffing procedures must be followed since this document is a joint Federal/State Environmental Impact Statement/Environmental Impact Report (EIS/EIR). The Draft EIS/EIR has to be reviewed by the National Guard Bureau, the Department of the Army, and approved for public release by the Assistant Secretary of the Army for Environment, Safety, and Occupational Health. With the additional 12 months, the Massachusetts Military Division is confident that a responsive and thorough Draft EIR will be filed with your office in Fall 1996.

As previously discussed, we are looking forward to the formation of the Community Working Group (CWG) and have some items which we would like to share with them. We appreciate the assistance Mr. Foster will provide in facilitating this group.

Should your staff have any technical questions on this matter please feel free to contact Captain Tracy Norris at (617) 944-0500, extension 2540, or Mr. Shaun Cody at extension 2541. If you have any questions please contact me.

Sincerely,

Raymond A Vezina

RAYMOND A. VEZINA
Major General, MAARNG
The Adjutant General

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

21 February 1996

Dr. Paul M. Cavanagh
HQ Camp Edwards
Environmental Protection Office
Building 1254
Camp Edwards, MA 02540

Dear Dr. Cavanagh,

Enclosed is the information you requested regarding state-listed beetles and lepidoptera from Plymouth and Barnstable counties. At this time we only have two records of state-listed invertebrates from within the boundary of the Massachusetts Military Reservation. The two species known from the Massachusetts Military Reservation are *Catocala herodias gerhardi* and *Anisota stigma*. The records state that the species were collected at mercury vapor lights at Otis AFB in July 1985.

The *Enallagma* records you requested are not within the boundaries of the Massachusetts Military Reservation. All three *Enallagma* records occur nearby on private and town owned land.

If you do observe any state-listed species at the Massachusetts Military Reservation please don't forget to send us observation forms. If you have any questions please feel free to call (508) 792-7270 x 155 or send e-mail to vfrey@state.ma.us.

Sincerely,

Vicki Frey

Vicki Frey
Assistant Data Manager

Natural Heritage & Endangered Species Program
Route 135, Westborough, MA 01581 Tel: (508) 792-7270 x 200 Fax: (508) 792-7275
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

Commonwealth of Massachusetts

Division of Fisheries & Wildlife

Wayne F. MacCallum, *Director*

6 June 1995

Andrea L. Fogg
ABB Environmental Services, Inc.
107 Audubon Road
Wakefield, MA 01880

Re: Environmental impact assessment - Mass. Military Reservation.
Bourne, Sagamore, MA
NHESP File No:95-437

Dear Ms. Fogg:

Thank you for contacting the Natural Heritage and Endangered Species Program for information regarding state-listed rare species in the vicinity of the above referenced site. We have reviewed the site and would like to offer the following comments.

Enclosed you will find a print-out of state-listed species known to occur within the boundaries of the Massachusetts Military Reservation. These species are the reason for designation of the site as Priority Habitat of Rare Species and Natural Communities. In addition, the Estimated Habitat of Rare Wetlands Wildlife is delineated where you have noted due to the occurrence of state-listed species of invertebrates in adjacent ponds. The New England Bluet (*Enallagma laterale*), Barrens Bluet (*Enallagma recurvatum*) and Tule Bluet (*Enallagma carunculatum*) have been documented in the adjacent ponds. All of these dragonflies are state-listed as Species of Special Concern.

This evaluation is based on the most recent information available in the Natural Heritage database, which is constantly being expanded and updated through ongoing research and inventory. Should your site plans change, or new rare species information become available, this evaluation may be reconsidered.

Please do not hesitate to call me if you have any questions.

Sincerely,

Diane Lauber

Diane Lauber
Environmental Review Assistant

Natural Heritage & Endangered Species Program
100 Cambridge Street, Boston, MA 02202 (617) 727-9194, (617) 727-3151
An Agency of the Department of Fisheries, Wildlife & Environmental Law Enforcement

United States Department of the Interior

FISH AND WILDLIFE SERVICE
New England Field Office
22 Bridge Street, Unit #1
Concord, New Hampshire 03301-4986

May 19, 1995

Andrea L. Fogg
ABB Environmental Services, Inc.
Corporate Place 128
107 Audubon Road
Wakefield, MA 01880

Dear Ms. Fogg:

This responds to your May 9, 1995 letter requesting information on the presence of federally-listed and proposed endangered or threatened species in relation to the Massachusetts Military Reservation located in Barnstable County, Massachusetts.

Based on information currently available to us, no federally-listed or proposed threatened and endangered species under the jurisdiction of the U.S. Fish and Wildlife Service are known to occur in the project area, with the exception of occasional transient endangered bald eagles (*Haliaeetus leucocephalus*) or peregrine falcons (*Falco peregrinus anatum*).

A list of federally-designated endangered and threatened species in Massachusetts is included for your information. Thank you for your cooperation and please contact Susi von Oettingen of this office at (603) 225-1411 if we can be of further assistance.

Sincerely yours,

Michael J. Bartlett
Supervisor
New England Field Office

THE PUBLIC ARCHAEOLOGY LABORATORY INC.
210 Lonsdale Avenue, Pawtucket, RI 02860 (401) 728 - 8780 Fax (401) 728 - 8784

September 19, 1996

Edward Bell
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125-3314

Re: Massachusetts Military Reservations
Cultural Resource Services & EIS
PAL Inc. #670

Dear Mr. Bell:

In response to your inquiry concerning the Massachusetts Military Reservation Facilities Upgrade project, the proposed plans call for the construction of ten new facilities within MMR. There is a total of 22 alternative locations for these facilities. Eleven of these alternative locations are in areas that were ranked as having low archaeological sensitivity during the 1987 reconnaissance survey (Davin and Gallagher 1987). The remaining eleven alternative locations were surveyed during the 1995 reconnaissance. Three of these alternative locations, MOUT-CTF 1, 2, and 3, were ranked as having high or moderate sensitivity. MOUT-CTF alternatives 1 and 3 are situated in the same locations. Additional archaeological testing has been recommended at MOUT-CTF 1, 2 and 3. The results of this 1995 reconnaissance survey with this recommendation for testing are discussed in detail in the report submitted to your office on September 16, 1996.

PAL Inc. has recently submitted a permit application for the intensive (locational) archaeological survey testing at the MOUT-CTF 1/3 and MOUT-CTF 2 alternative locations. If you have any additional questions or comments regarding the report or the permit application for this project please contact Patricia Fragola or me at your convenience.

Sincerely,

Deborah C. Cox
President

DCC:fp

cc: ✓Peter Grill, ABB Environmental

W\LETTERS\MMRUP\9.19.96\FP

Historical and Archaeological Consultants

THE PUBLIC ARCHAEOLOGY LABORATORY INC.
210 Lonsdale Avenue, Pawtucket, RI 02860 (401) 728 - 8780 Fax (401) 728 - 8784

September 16, 1996

Brona Simon
State Archaeologist
Massachusetts Historical Commission
220 Morrissey Boulevard
Boston, Massachusetts 02125-3314

Re: Reconnaissance Archaeological Survey
Massachusetts Military Reservation Facilities Upgrade
PAL Inc. #670

Dear Ms. Simon:

Enclosed for your review and comment please find a copy of the report titled *Reconnaissance Archaeological Survey, Massachusetts Military Reservation Facilities Upgrade, Cape Cod, Massachusetts.*

If you have any questions please call me at your convenience.

Sincerely,

Deborah C Cox

Deborah C. Cox
President

DCC:fp

Enclosure

cc:✓Peter Grill, ABB Environmental

W\LETTERS\MASSMIL\9.16.96\FP

Historical and Archaeological Consultants

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

September 12, 1996

Deborah C. Cox
Public Archaeology Laboratory, Inc.
210 Lonsdale Avenue
Pawtucket, RI 02860

RE: Massachusetts Military Reservation Facilities Upgrade, Bourne, Falmouth, Sandwich, Mashpee.
MHC #RC.3311. EOEA #5834.

Dear Deborah:

Thank you for submitting a permit application (950 CMR 70) to conduct an intensive (locational) archaeological survey of two portions of the project area referenced above. MHC understands that the proposed survey is for the Military Operations on Urbanized Terrain (MOUT) Collective Training Facility (CTF), Scenarios 1/3 and 2.

It would assist this review to have the opportunity to review the results of the reconnaissance archaeological survey for the overall Facilities Upgrade project. I understand that an Environmental Impact Report (EIR) is being prepared for the project, and that the results of the reconnaissance survey will be included. MHC requests that sensitive archaeological site locational data not be included in the EIR. Summary information on the results of the reconnaissance survey, discussion of the need for additional locational (intensive) archaeological survey, evaluation of significance of cultural resources identified, and consideration of alternatives to avoid, minimize, or mitigate impacts should be included in the EIR.

Could you please inform me whether there are other aspects of the Facilities Upgrade project that will require intensive (locational) archaeological survey? If so, would it not be cost-effective to undertake locational survey for all these project areas at the same time?

These comments are provided to assist in compliance with Section 106 and 110 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), MGL Chapter 9, ss. 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 70-71), and MEPA (301 CMR 11). Please contact Edward L. Bell of my staff if you have any questions or need further information.

Sincerely,

for: Brona Simon
State Archaeologist
Deputy State Historic Preservation Officer
Massachusetts Historical Commission

xc: Peter Grill, ABB Environmental Services
Secretary Trudy Coxe, EOEA/MEPA
Shaun Cody, Office of State Quartermaster/Environmental Affairs

220 Morrissey Boulevard, Boston, Massachusetts 02125 · (617) 727-8470
Fax: (617) 727-5128 TDD: 1-800-392-6090

The Commonwealth of Massachusetts

MILITARY DIVISION

OFFICE OF THE STATE QUARTERMASTER

CAMP CURTIS GUILD, READING, MA 01867-1999

L.R. VOLPE
COL, STATE STAFF
STATE QUARTERMASTER

In reply refer to:
MAAR-SQM-EM

27 August 1996

Ms. Andrea Arnold
Environmental Reviewer
Natural Heritage and Endangered Species Program
Massachusetts Division of Fisheries and Wildlife
Route 135
Westborough, MA 01581

Dear Ms. Dinkeloo,

Enclosed is the map that you requested on 16 August. I apologize for the time that it took to get this item to you.

We would welcome the opportunity to meet with you at your convenience to show you the proposed locations and to discuss potential impacts and mitigation measures. Please contact me at (617) 944-0500, extension 2541 or Captain Tracy Norris at extension 2540.

Sincerely,

Shaun Cody

SHAUN CODY
Director of Environmental
Affairs

The Commonwealth of Massachusetts

MILITARY DIVISION

OFFICE OF THE STATE QUARTERMASTER

CAMP CURTIS GUILD, READING, MA 01867-1999

L.R. VOLPE
COL, STATE STAFF
STATE QUARTERMASTER

In reply refer to:
MAAR-SQM-EM

1 August 1996

Ms. Hanni Dinkeloo
Environmental Reviewer
Natural Heritage and Endangered Species Program
Massachusetts Division of Fisheries and Wildlife
Route 135
Westborough, MA 01581

Dear Ms. Dinkeloo,

Enclosed are descriptions of all proposed projects and project alternative locations contained in the preliminary draft Massachusetts Military Reservation Modernization Environmental Impact Statement. Although the draft of the EIS will be provided to you when available for public release, it is our desire to bring portions of this document to your attention at this time so that any issues may be identified and addressed, and revisions incorporated into the final draft.

We have attempted to make every effort to minimize potential negative impacts associated with the proposed projects. However, during our review process we identified a potential conflict between one project, the Air National Guard Environmental Facility, and potential nesting habitat for State-listed grassland birds. Two of the proposed locations for this facility occur in or near areas identified as Upland Sandpiper, Northern Harrier, or Grasshopper Sparrow habitat in 1985 (White and Melvin.) Although the value of this area as nesting habitat has decreased over the years due to plant succession, our surveys last year indicate that nesting sandpipers and Grasshopper Sparrows still occur in low numbers.

I am requesting your assistance in determining the potential impacts, if any, on grassland bird habitat that may be caused by the construction of the environmental facility. I am also requesting your assistance in identifying possible mitigation measures to minimize potential impacts, should any occur.

We would welcome the opportunity to meet with you at your convenience to show you the proposed locations and to discuss potential impacts and mitigation measures. Please contact me at (617) 944-0500, extension 2541 or Captain Tracy Norris at extension 2540.

Sincerely,

Shaun Cody
SHAUN CODY
Interim Director of Environmental
Affairs

The Commonwealth of Massachusetts

MILITARY DIVISION

OFFICE OF THE STATE QUARTERMASTER

CAMP CURTIS GUILD, READING, MA 01867-1999

L.R. VOLPE
COL, STATE STAFF
STATE QUARTERMASTER

In reply refer to:

MAAR-SQM-EM

August 1, 1996

Mr. John Peters
Executive Director
Massachusetts Commission on Indian Affairs
1 Ashburton Place
Boston, Massachusetts 02108

Dear Mr. Peters,

The Massachusetts National Guard (MANG) has initiated formal consultation with respect to the undertaking "Massachusetts Military Reservation Modernization" at the Massachusetts Military Reservation (MMR), Cape Cod, Massachusetts with the Massachusetts Historical Commission. Mr. Edward Bell suggested we contact you concerning Native American individuals.

We have sent information pertaining to the undertaking and the area of potential effect to the point of contact of the Wampanoag tribe on Martha's Vineyard, and the Naragansett tribe in Rhode Island for their comments (section 800.1(c)(2)(iii)). To further ensure that any properties of historic value to Native American groups are considered during project planning, we would appreciate your help in identifying any additional groups or individuals that may have interest in the projects' activities, or any traditional resources which may exist in the area of potential effect. It is our goal in seeking information, to protect areas important to Native Americans who now live, or have lived in the past, within the project area.

Enclosed are copies of the letters sent to the Wampanoag and Naragansett tribes with the "Fact Sheet" with brief descriptions of the undertaking and maps of the areas of potential effect which they also received.

Thank you for your cooperation and assistance with our efforts to address any possible concerns related to the Training Modernization project at MMR. If you have any questions, please contact myself at (617) 944-0500, extension 2525 or Captain Tracy Norris (617) 944-0500, extension 2540.

Shaun Cody

Encls

SHAUN CODY
Interim Director of Environmental
Affairs

July 25, 1996

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

Shaun Cody
Interim Director
Environmental Affairs
Office of the State Quartermaster
Camp Curtis Guild
Reading, MA 01867-1999

RE: Massachusetts Military Reservation, Bourne, Sandwich, Falmouth, Mashpee.
MHC #3311. EOEA #5834.

Dear Mr. Cody:

Thank you for your inquiry concerning Native American individuals or groups that may have an interest in proposed projects at the project area referenced above.

For this information, I suggest that you contact John Peters, Executive Director, Massachusetts Commission on Indian Affairs, 1 Ashburton Place, Boston, MA 02108, Tel. 617-727-6394. You may wish to send the same information to the Commission on Indian Affairs that you sent to us.

MHC understands that the Public Archaeology Laboratory, Inc. is presently conducting additional archaeological reconnaissance survey for the proposed project areas. MHC looks forward to reviewing and commenting on the results of these investigations when they are available.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) and MGL c. 9, ss. 26-27C (950 CMR 70). If you have any questions or need further information, please feel free to contact me.

Sincerely,

Edward L. Bell
Senior Archaeologist
Massachusetts Historical Commission

xc: John Peters, Massachusetts Commission on Indian Affairs
Deborah C. Cox, PAL, Inc.
Secretary Trudy Coxe, EOEA/MEPA
Jeffrey A. Bridge, ABB Environmental Services, Inc.

220 Morrissey Boulevard, Boston, Massachusetts 02125 · (617) 727-8470
Fax: (617) 727-5128 TDD: 1-800-392-6090

The Commonwealth of Massachusetts

MILITARY DIVISION

OFFICE OF THE STATE QUARTERMASTER

CAMP CURTIS GUILD, READING, MA 01867-1999

L.R. VOLPE
COL, STATE STAFF
STATE QUARTERMASTER

In reply refer to: MAAR-SQM-EM

June 26, 1996

Mr. George H. Hopkins
Chief Sachem
Narragansett Indian Tribe
P.O. Box 268
Charleston, RI 02813

Dear Mr. Hopkins,

The Massachusetts National Guard is in the process of preparing an Environmental Impact Statement for training modernization at the Massachusetts Military Reservation (see enclosure). As a part of this effort, in accordance with Section 106 of the National Historic Preservation Act, and its implementing regulation 36 CFR 800, "Protection of Historic Properties," we are initiating activities to identify any significant cultural resources that may exist within the area of potential effect.

To ensure that any areas of sacred or heritage concern to local Native American groups are considered during project planning, we would appreciate your help in identifying any groups or individuals that might have interest in the projects' activities, or any traditional resources which may exist within the area of potential effect. It is our goal in seeking information, to protect areas important to Native Americans who now live, or have lived in the past, within the project area.

Thank you for your cooperation and assistance with the Massachusetts National Guard's efforts to address any possible concerns related to the training modernization project at Massachusetts Military Reservation. If you have any questions, please contact Captain Tracy Norris at (617) 944-0500, extension 2540.

Shaun Cody
SHAUN CODY
Interim Director of Environmental
Affairs

The Commonwealth of Massachusetts

MILITARY DIVISION

OFFICE OF THE STATE QUARTERMASTER

CAMP CURTIS GUILD, READING, MA 01867-1999

L.R. VOLPE
COL, STATE STAFF
STATE QUARTERMASTER

In reply refer to: MAAR-SQM-EM

June 26, 1996

Ms. Beverly Wright
Chairperson
Wampanoag Tribal Council of Gay Head
State Road, RFD Box 137
Gay Head, MA 02535

Dear Ms. Wright,

The Massachusetts National Guard is in the process of preparing an Environmental Impact Statement for training modernization at the Massachusetts Military Reservation (see enclosure). As a part of this effort, in accordance with Section 106 of the National Historic Preservation Act, and its implementing regulation 36 CFR 800, "Protection of Historic Properties," we are initiating activities to identify any significant cultural resources that may exist within the area of potential effect.

To ensure that any areas of sacred or heritage concern to local Native American groups are considered during project planning, we would appreciate your help in identifying any groups or individuals that might have interest in the projects' activities, or any traditional resources which may exist within the area of potential effect. It is our goal in seeking information, to protect areas important to Native Americans who now live, or have lived in the past, within the project area.

Thank you for your cooperation and assistance with the Massachusetts National Guard's efforts to address any possible concerns related to the training modernization project at Massachusetts Military Reservation. If you have any questions, please contact Captain Tracy Norris at (617) 944-0500, extension 2540.

Shaun Cody
SHAUN CODY
Interim Director of Environmental
Affairs

The Commonwealth of Massachusetts

MILITARY DIVISION

OFFICE OF THE STATE QUARTERMASTER

CAMP CURTIS GUILD, READING, MA 01867-1999

L.R. VOLPE
COL, STATE STAFF
STATE QUARTERMASTER

In reply refer to: MAAR-SQM-ENV

June 26, 1996

Brona Simon
Deputy State Historical Preservation Officer
Massachusetts Historical Commission
The Massachusetts Archives Building
220 Morrissey Boulevard
Boston, Massachusetts 02125

Dear Ms. Simon,

In accordance with Section 106 of the National Historic Preservation Act of 1966, its implementing regulation 36 CFR 800, "Protection of Historic Properties," and your letter dated October 19, 1995, the Massachusetts National Guard (MANG) is initiating formal consultation with respect to the undertaking "Massachusetts Military Reservation Modernization" at the Massachusetts Military Reservation (MMR), Cape Cod, Massachusetts. Enclosed is a "Fact Sheet" with brief descriptions of the undertaking and maps of the areas of potential effect (enclosures 1 and 2).

Following a literature search in accordance with section 800.4(a), the MANG has determined that additional historic properties identification efforts within the MMR need to be conducted.

In accordance with 800.4(b), "Locating historic properties," the MANG has contracted out survey work conducted according to the standards established in the Secretary of the Interior's. "Standards and Guidelines for Archeology and Historic Preservation.."

We have sent information pertaining to the undertaking and the area of potential effect to the point of contact of the Wampanoag tribe on Martha's Vineyard, and the Naragansett tribe in Rhode Island for their comments (section 800.1(c)(2)(iii)). To further ensure that any properties of historic value to Native American groups are considered during project planning, we would appreciate your help in identifying any additional groups or individuals that may have interest in the projects' activities, or any traditional resources which may exist in the area of potential effect. It is our goal in seeking information, to protect areas important to Native Americans who now live, or have lived in the past, within the project area.

Thank you for your cooperation and assistance with our efforts to address any possible concerns related to the Training Modernization project at MMR. If you have any questions, please contact Captain Tracy Norris (617) 944-0500, extension 2540.

Shaun Cody
SHAUN CODY
Interim Director of Environmental
Affairs

Encls

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

October 19, 1995

William A. Quigley
Brigadier General
State Quartermaster
Contracting Office
MA Military Division
Camp Curtis Guild
Reading, MA 01867-1999

RE: Massachusetts Military Reservation Facilities Upgrade, Camp Edwards Master Plan, Bourne & Sandwich. MHC #3311. EOEA #5834.

Dear General Quigley:

It has come to our attention that the project, Massachusetts Military Reservation Facilities Upgrade, is the same project as the Camp Edwards Master Plan, which MHC has commented on, requesting more information (see MHC 12/6/94, copy enclosed). MHC's comments on the permit application (950 CMR 70) submitted by the Public Archaeology Laboratory, Inc. for a reconnaissance archaeological survey also indicated that a description of the proposed projects and plans of existing and proposed conditions should be submitted to the MHC for our review (see MHC 9/19/95, copy enclosed). I understand that the project environmental consultants are aware of this request, and that this information is being prepared to be submitted to the MHC.

As soon as they are available, please submit this information to the MHC for our review and comment in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800), M.G.L. Chapter 9, ss. 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 70-71), and MEPA (301 CMR 11). Should you have any questions, please feel free to contact Edward L. Bell of my staff.

Sincerely,

for: Brona Simon
State Archaeologist
Deputy State Historic Preservation Officer
Massachusetts Historical Commission

xc: Deborah C. Cox, Public Archaeology Laboratory, Inc.
Jeffrey A. Bridge, ABB Environmental Services, Inc.
Secretary Trudy Coxe, EOEA/MEPA

Enclosures (MHC 12/6/94, 9/19/95)

220 Morrissey Boulevard, Boston, Massachusetts 02125 · (617) 727-8470
Fax: (617) 727-5128 TDD: 1-800-392-6090

The Commonwealth of Massachusetts
William Francis Galvin, Secretary of the Commonwealth
Massachusetts Historical Commission

September 19, 1995

Deborah C. Cox
Public Archaeology Laboratory, Inc.
210 Lonsdale Avenue
Pawtucket, RI 02860

RE: Massachusetts Military Reservation, Facilities Upgrade, Bourne & Sandwich.

Dear Deborah:

Staff of the Massachusetts Historical Commission have reviewed the permit application (950 CMR 70) for a reconnaissance archaeological survey for the project area referenced above, received by the MHC on September 13, 1995.

Review of MHC's files indicates that we have not reviewed these proposed projects. Please have the project proponent or engineer submit information to the MHC on the proposed projects; a description of the project and plans of existing and proposed conditions should be submitted for our review and comment.

During the background research portion of this investigation, please be sure to review the available archaeological reports for investigations within and in the vicinity of the Otis Air Force Base and Camp Edwards (Bourne, Sandwich, Falmouth, Mashpee). The PAL, Inc. investigations of the Cape Cod Canal and the Algonquin Gas Transmission Company's Canal Lateral project should also benefit your investigation. A permit for reconnaissance survey has been recently issued to Gerald R. Macomber for the Cape Cod Air Force Station in Bourne; the report he is preparing will include the results of an intensive survey undertaken in 1992 by the Office of Public Archaeology at Boston University. Please be sure to consult with Mr. Macomber on the results of his investigation.

A permit has been issued for this investigation, and I look forward to reviewing the results.

These comments are provided to assist in compliance with Section 106 of the National Historic Preservation Act of 1966, as amended (36 CFR 800) and M.G.L. Chapter 9, ss. 26-27C (950 CMR 70). If you have any questions, please feel free to contact me.

Sincerely,

Edward L. Bell
Senior Archaeologist
Massachusetts Historical Commission

Enclosure

xc: Jeffrey A. Bridge, ABB Environmental Services, Inc.

220 Morrissey Boulevard, Boston, Massachusetts 02125 · (617) 727-8470
Fax: (617) 727-5128 TDD: 1-800-392-6090

Bourne

December 6, 1994

William A. Quigley
Brigadier General
State Quartermaster
Contracting Office
MA Military Division
Camp Curtis Guild
Reading, MA 01867-1999

RE: Camp Edwards Master Plan EOEA #5834 / MHC #3311

Dear General Quigley:

Thank you for submitting a copy of the Notice of Project Change for the Camp Edwards Master Plan. Staff of the Massachusetts Historical Commission (MHC) have reviewed the information you submitted.

The MHC, office of the State Historic Preservation Officer, is presently unable to determine what effects the proposed construction activities listed below may have on historic or archaeological resources without the submission of project location maps: Infantry Squad Battle Course; Military Operations on Urban Terrain Assault Course; Military Operations on Urban Terrain Collective Training Facility; Modified Record Fire Range; Multipurpose Machine Gun Transition Range; and Unit Training Equipment Site.

Review of MHC's files indicates that a preliminary archaeological reconnaissance study of Camp Edwards was conducted in 1987. The archaeological reconnaissance report includes maps which depict areas within Camp Edwards which are known or expected to contain significant archaeological sites. By comparing map locations of the proposed projects referenced above, the MHC will be able to determine whether these projects will have an effect on known archaeological sites, or whether additional archaeological surveys are necessary in compliance with Section 106 of the National Historic Preservation Act and NEPA.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1966 as amended (36 CFR 800), the National Environmental Policy Act, MEPA, and Massachusetts General Laws, Chapter 9, Sections 26-27C, as amended by Chapter 254 of the Acts of 1988 (950 CMR 71). If you have any questions, please feel free to contact me.

Sincerely,

Brona Simon

Brona Simon
State Archaeologist
Deputy State Historic Preservation Officer
Massachusetts Historical Commission

xc: Secretary Trudy Coxe, EOEA/MEPA Unit
Cape Cod Commission

Massachusetts Historical Commission, Judith B. McDonough, *Executive Director, State Historic Preservation Officer*
80 Boylston Street, Boston, Massachusetts 02116-4802 (617) 727-8470 Fax: (617) 727-5128 TDD: 1-800-392-609

Office of the Secretary of State, Michael J. Connolly, *Secretary*

RECEIVED
FEB 18 1993
MEPA

February 17, 1993

Wayne F. Wagner
Major General
The Adjutant General
Massachusetts Army National Guard
Camp Curtis Guild
Reading, MA 01867

RE: Camp Edwards Military Reservation Master Plan. EOEA #5834.

Dear General Wagner:

It has come to the attention of the Massachusetts Historical Commission that a Notice of Project Change for the proposed project referenced above was filed with the Executive Office of Environmental Affairs. MHC received a copy of the NPC on February 5, 1993.

As outlined in the NPC, a reconnaissance archaeological survey completed in 1987 identified a number of potentially significant archaeological sites. The report of the survey offered recommendations in relation to the master plan, and specific projects were evaluated for their potential to impact archaeological resources. MHC concurred with the report's recommendations, and requested further consultation as the planning commenced for the projects that were recommended for further archaeological investigations (MHC 6/26/89, copy enclosed).

The proposed changes to the master plan should be evaluated on a project-by-project basis in relation to the 1987 report recommendations and the results of other archaeological investigations that have been subsequently conducted in the project area for the wastewater treatment facilities. The results of this evaluation should be submitted to the MHC for our review and comment.

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act of 1992 (36 CFR 800), M.G.L. c.9, ss.26-27C (950 CMR 71) and MEPA (301 CMR 11). If you have any questions, please feel free to contact Edward L. Bell or Allen Johnson of my staff.

Sincerely,

Brona Simon

Brona Simon
State Archaeologist
Deputy State Historic Preservation Officer
Massachusetts Historical Commission

Enclosure (MHC 6/26/89)

xc: Secretary Susan F. Tierney, EOEA/MEPA
Sara Korjeff, Cape Cod Commission
Kate Atwood, USACOE

Massachusetts Historical Commission, Judith B. McDonough, *Executive Director, State Historic Preservation Officer*
80 Boylston Street, Boston, Massachusetts 02116 (617) 727-8470
Office of the Secretary of State, Michael J. Connolly, *Secretary*

June 26, 1989

Wayne F. Wagner
Major General
The Adjutant General
Massachusetts Army National Guard
Camp Curtis Guild
Haverhill St.
Reading, MA 01867

Re: Camp Edwards Training Site: Bourne, Falmouth, Mashpee, and Sandwich

Dear General Wagner:

Thank you for recently submitting a copy of the report entitled "Cultural Resource Reconnaissance of Camp Edwards Training Site", which was prepared by the Public Archaeology Laboratory, Inc., in January 1987.

Review of the report reveals that a number of potentially significant archaeological sites were identified in the survey. In addition, recommendations were made in relation to the master plan for Camp Edwards. Specific projects which are under consideration for construction at Camp Edwards were evaluated for their potential to adversely impact archaeological resources. The Massachusetts Historical Commission concurs with the report's recommendations (summarized on pages 107-109 in the report). The MHC looks forward to further consultation, as planning commences for in the projects which are recommended for further archaeological investigations.

The MHC requests that original, unbound site inventory forms (MHC Form D) be submitted for the six prehistoric sites and six archaeological loci which were discovered (950 CMR 70.14(1)).

These comments are offered to assist in compliance with Section 106 of the National Historic Preservation Act and M.G.L. Ch. 9, ss. 26-27C.

If you have any questions, please feel free to contact me.

Sincerely,

Brona Simon

Brona Simon
State Archaeologist
Deputy State Historic Preservation Officer
Massachusetts Historical Commission

BS/rw

Xc: Marie Bourassa, Army Corps of Engineers

Massachusetts Historical Commission, Valerie A. Talmage, *Executive Director, State Historic Preservation Officer*
80 Boylston Street, Boston, Massachusetts 02116 (617) 727-8470

Office of the Secretary of State, Michael J. Connolly, *Secretary*

MASS HIGHWAY
William F. Weld
Governor
Argeo Paul Cellucci
Lieutenant Governor
James J. Kerasiotes
Secretary
Laurinda T. Bedin
Commissioner

July 12, 1995

Mr. Jeffrey A. Bridge
ABB Environmental Services
Corporate Place 128
107 Audubon Road
Wakefield, MA 01880

Dear Mr. Bridge:

I have read your letter of July 7, 1995, and applaud your moving forward with this EIS/EIR for Camp Edwards and the MMR. The depth of material that you are asking for is such that your Traffic Engineering Consultant should be in contact with this office. If you do not have one, I would strongly advise you to retain one. The public you will be dealing with will be more concerned about traffic than almost any other issue, with the possible exception of water.

Our files are open to you, and I would recommend that you or a member of your staff contact me or my Deputy Mr. Hari Vohra P.E. at 973- 7360 and come in to see what we have to help you.

In closing, as the former DEH of Camp Edwards, I want you to succeed. Without a legitimate traffic expert I believe that your labors will be in vain.

Sincerely yours,

Charles F. Sterling III, P.E.
State Traffic Engineer

cc LTC K. Roger Simmons

Massachusetts Highway Department • Ten Park Plaza, Boston, MA 02116-3973 • (617) 973-7800

ABB

July 7, 1995

Mr. Chuck Sterling
State Traffic Engineer
Massachusetts Highway Department
10 Park Plaza
Boston, MA 02116

RE: Request for Information
Massachusetts Military Reservation EIS/EIR
Bourne, Falmouth, Mashpee, Sandwich, MA

Dear Mr. Sterling:

This is in reference to our discussion on July 5, 1995 regarding the request for existing, available traffic - related information within the vicinity of the Massachusetts Military Reservation (MMR) located on upper Cape Cod, Massachusetts.

As stated, ABB-ES is preparing an EIS/EIR for the Massachusetts Military Division and National Guard Bureau in connection with the proposed modernization of the MMR. As such, project-related traffic impacts will need to be identified and analyzed in light of the current and projected base utilization. The study area envisioned for this analysis includes the surrounding roadway network of the MMR, as follows:

- Route 28 (MacArthur Blvd);
- Route 151 (Nathan S. Ellis Highway);
- Route 130 (Sandwich Road);
- Route 6;
- Route 6W;
- Key intersections; e.g. the Bourne rotary and all currently utilized gates to access the MMR; and the
- Bourne and Sagmore Bridges.

For purposes of this EIS/EIR document, 1994 has been determined to represent baseline conditions. Therefore, per your directive, we respectfully request the following specific information to facilitate the data collection effort to characterize 1994 baseline conditions in terms of existing area traffic operations and safety and to enable the required traffic impact analysis to project future traffic conditions within the study area:

ABB Environmental Services, Inc.

Corporate Place 128
107 Audubon Road
Wakefield, MA 01880

Telephone
(617) 245-6606

Fax
(617) 246-5060

- Average daily traffic (on a monthly basis to reflect seasonality differences);
- Temporal and directional distribution;
- Truck-related activity;
- Peak hour conditions;
- Level of service;
- Accident history (1992-1994); and
- Traffic networks for existing morning and evening peak hour conditions.

Finally, any reference to a statewide/townwide transportation master plan and/or recently conducted traffic impact study and any information regarding other major approved development projects and/or planned roadway improvements which may affect future traffic operations within the vicinity of the MMR would be very beneficial.

Should you have any questions concerning this request, please contact me or Peter Grill at (617) 245-6606. Your cooperation and attention to this matter is very much appreciated.

Sincerely,

ABB Environmental Services, Inc.

Jeffrey A. Bridge

Jeffrey A. Bridge
Applied Ecology Team Leader

cc: LTC Roger Simmons - MAARNG
Eric Andersen - NGB-ARE
Shawn Cody - MAARNG
Peter Grill - ABB-ES
Dave Heislein - ABB-ES

APPENDIX D

NOTICE OF INTENT

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Notice of Intent To Prepare a Draft Environmental Impact Statement for Proposed Construction at the Massachusetts Military Reservation (MMR)

AGENCY: Department of the Army, Department of Defense.

ACTION: Notice of intent.

SUMMARY: This Notice of Intent is for the preparation of a Draft Environmental Impact Statement (DEIS) for proposed Army and Air National Guard projects at the Massachusetts Military Reservation. The proposal includes renovation and rehabilitation of existing facilities, range improvements, demolition and construction of facilities, and development of ranges.

Lead Agencies are: The Massachusetts Military Division and the National Guard Bureau.

Various alternatives have been developed for consideration regarding the proposed projects at the Massachusetts Military Reservation. The following constitutes a list of those alternatives to be considered in the DEIS:

(1) No action:
(2) Relocation of actions on-site and
(3) Alternative locations off-site.

Resource categories that will be analyzed include: physical environment, water quality, groundwater, air quality, biological resources, land use, socioeconomic, noise, and cultural resources.

SCOPING: The Massachusetts Military Division will conduct a public scoping meeting relating to the proposed actions. Public participation in the DEIS process is essential to assist the decision maker in defining the scope of analysis considered in the DEIS.

Interested individuals, governmental agencies, and private organizations are invited to submit information and comments on this proposed action for consideration by the National Guard Bureau. Information that would assist the National Guard Bureau in analyzing the potential significant environmental consequences are solicited. This includes information on other environmental studies planned or completed in the area of the Massachusetts Military Reservation; other alternatives; potential impacts associated with the proposed action; and recommended mitigation measures.

Concerned individuals and agencies may express their views either by writing to the designated point of contact or participating in a public scoping meeting to be held at a convenient location near the Massachusetts Military Reservation. The date, time and location for the meeting will be announced through letters, public notices, display advertisements and released to newspaper of general circulation a minimum of 15 days prior to the meeting. Those wishing to provide information or data relevant to the environmental analysis of the proposed actions or alternatives are encouraged to do so at the public scoping meetings.

Upon completion, the DEIS will be available to the public. The availability of this document will be announced by means of public notices so that all interested parties may review and comment on the document. A public hearing to solicit public response to the analysis will also be scheduled.

ADDRESSES: Interested parties can also furnish written comments or materials to Mr. Ernest B. Keating, Massachusetts National Guard, Chief Administrator, Unified Environmental Planning Function, Bldg 1204, Camp Edwards, MA 02542, (508) 968-5824 or 5908.

Dated: August 3, 1994.

Raymond J. Fatz,

Acting Deputy Assistant Secretary of the Army (Environment, Safety, and Occupational Health) OASA (IL&E).

[FR Doc. 94-21525 Filed 8-30-94; 8:45 am]

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APPENDIX E

AIR QUALITY

E-1 WEAPONS FIRING POLLUTANT EMISSIONS RATE CALCULATIONS

E-2 CANTONMENT PROJECT EMISSIONS CALCULATIONS

E-3 INDIRECT (MOBILE SOURCE) EMISSIONS CALCULATIONS

E-4 CONSTRUCTION-RELATED EMISSIONS

E-5 MASSACHUSETTS MILITARY RESERVATION FACILITIES UPGRADE RECORD OF NON-APPLICABILITY

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APPENDIX E-1

AIR QUALITY
WEAPONS FIRING POLLUTANT EMISSIONS RATE CALCULATIONS

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APPENDIX E-1
POLLUTANT EMISSIONS RATE CALCULATION FOR AMMUNITION FIRING

E-1 Pollutant Emissions Rate Calculation Methodology

An emissions rate analysis was conducted to estimate pollutant-specific emissions released into the atmosphere when various types of ammunition is fired. For the small arms fired at Camp Edwards, pollutant-specific emissions rates (pounds of pollutant per round fired) were developed for 5.56 mm, 7.62 mm, and 0.50 caliber rounds. Pollutant emissions rates for the other smaller caliber arms fired at Camp Edwards were estimated by assuming that each round produced the same amount of pollutants as released into the atmosphere when a 5.56 mm Round was fired.

Pollutant-specific emissions rates were determined for the following pollutants as shown in Table E-1:

Table E-1

Pollutants	Symbol	Molecular Weight (MW)
Carbon Monoxide	CO	28
Nitrogen Oxides (as NO_2)	NO_x	46
Sulfur Dioxide	SO_2	64
Particulate Matter	PM	Varies
Lead	Pb	207

The pollutant emissions rates for the various types of ammunition were calculated using the following procedure:

1. The material type (i.e., propellant, ignitor, tracer mix) and amount (weight) used in each Round was determined.

2. Based on a thermodynamic equilibrium combustion spreadsheet provided for the various material (i.e., propellant, ignitor, tracer mix) used in each Round, the moles of pollutant produced for each kilogram (Kg) of material used in each Round were obtained. This pollutant-specific value for each material type was multiplied by the pollutant molecular weight to obtain a pollutant emissions factor with the units of grams (g) of pollutant per Kg of material used in each Round.

3. The pollutant-specific emissions factor was next multiplied by the weight (grains/Round) of the material used in each Round to obtain a pollutant-specific emissions rate. The pollutant-specific emissions rates for each material used in each Round are added together to obtain an emissions rate with the units in pounds of pollutant per Round.

4. For ammunition that uses a Tracer Mix, separate pollutant-specific emissions rate calculation were made for Rounds with a Tracer Mix and Rounds without a Tracer Mix. Average emissions rates were estimated assuming that 80% of the Rounds fired were without a Tracer Mix and 20% of the Rounds included a Tracer Mix.

5. Based on the number of Rounds fired over a set period or firing scenario, the total pollutant-specific emissions were obtained by multiplying the number of Rounds fired by the total emissions rate determined above.

E-2 Pollutant Emissions Analysis for 5.56 mm Round

The material type (i.e., propellant, ignitor, tracer mix) and amount (weight) used in each 5.56 mm Round are as shown in Table E-2:

Table E-2

Material Used per 5.56 mm Round	Weight [Grains (Gr)]
Primer Mix (FA-956)	0.38
Propellant Mix (WC-844)	28.50
Tracer Mix (R-284)	1.20
Ignitor Mix (I-560)	1.20
Ignitor Mix (I-561)	1.00

E-2.1 Carbon Monoxide (CO)

The carbon monoxide (CO) emissions rate for 5.56 mm Round was calculated as shown in Table E-3:

Table E-3

Material	Moles/Kg (a)	g/Kg (b)	Grains/Round (c)	Lbs/Round (d)
Primer (FA-956)	4.587	128.44	0.38	6.974E-06
Propellant (WC-844)	19.091	534.55	28.5	2.177E-03
Tracer (R-284)	3.947	110.52	1.2	1.895E-05
Ignitor (I-560)	3.959	110.85	1.2	1.901E-05
Ignitor (I-561)	3.393	95.00	1.0	1.358E-05
Total with Tracer			**32.28**	**2.236E-03**
Total without Tracer			**31.08**	**2.217E-03**
TOTAL (Average Mix)			**31.32**	**2.220E-03**

(a) Moles/Kg = moles of pollutant produced per kilogram (Kg) of material.
(b) g/Kg = grams (g) of pollutant per kilogram (Kg) of material. Example: Primer (FA-956) - 4.587 moles of CO/Kg of Primer material. 4.587 moles/Kg x 28 grams/mole = 128.4 g CO/Kg of Primer
(c) Grains/Round = grains of material per 5.56 Round Example: Primer (FA-956) - 0.38 grains per 5.56 Round
(d) Lbs/Round = pounds of pollutant released per 5.56 Round Example: 1 Kg = 1,000 grams x 15.43 grains/gram = 15,430 grains Primer (FA-956) - 128.4 g CO/Kg x 1 Kg/15,430 grains = 3.163E-03 grams (g) CO/Round x 2.205E-03 lbs/gram = 6.974E-06 lbs CO per 5.56 Round

The carbon monoxide (CO) emissions rate was calculated to be 2.20E-03 (0.0022) pounds for each 5.56 Round fired based on the assumption that every fifth Round contains a Tracer mix.

The Total (with Tracer) and Total (without Tracer) CO emissions rates are calculated by adding together the appropriate components for each type of 5.56 Round. The Total (Average Mix) CO emissions rate is calculated as follows:

CO Emissions Rate (Total Ave. Mix) = 0.80 x Total without Tracer + 0.20 x Total with Tracer = 0.20 x 2.236E-06 + 0.80 x 2.217E-03 = 2.220E-03 pounds of CO per 5.56 Round.

E-2.2 Nitrogen Oxides (NO_x)

The nitrogen oxides (NO_x) emissions rate for 5.56 mm Round was calculated as shown in Table E-4:

Table E-4

Material Nitrogen Oxide (NO)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Primer (FA-956)	0.058	1.74	0.38	9.449E-08
Propellant (WC-844)	0.000	0.00	28.5	0.000E-00
Tracer (R-284)	0.063	1.89	1.2	3.241E-07
Ignitor (I-560)	0.002	0.06	1.2	1.029E-08
Ignitor (I-561)	0.000	0.00	1.0	0.000E-00
Total with Tracer	**NO**		**32.28**	**4.289E-07**
Total without Tracer	**NO**		**31.08**	**1.048E-07**
TOTAL (Average Mix)	**NO**		**31.32**	**1.696E-07**
Refer to the bottom of Table E-3 for definition of notes.				

Nitrogen oxides (NO_x) emissions include nitrogen oxide (NO) and nitrogen dioxide (NO_2). No emissions factor (moles/Kg) was provided for nitrogen dioxide (NO_2). In calculating pollutant emissions rates, NO emissions are assumed to be oxidized to NO_2 in the atmosphere. Therefore, NO emissions are treated as NO_2 emissions for air quality assessment analyses. For this study, the NO emissions rates were scaled by 1.53 (the NO_2/NO molecular weight ratio) to estimate a nitrogen oxides (NO_x) emissions rate as shown in Table E-5:

NO_x Emissions Rate = NO Emissions Rate x 46/30

Table E-5

Material Nitrogen Oxide (NO_x)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Total with Tracer	NO_x		32.28	6.576E-07
Total without Tracer	NO_x		31.08	1.607E-07
TOTAL (Average Mix)	NO_x		31.32	2.600E-07

E-2.3 Sulfur Dioxide (SO_2)

The sulfur dioxide (SO_2) emissions rate for 5.56 mm Round was calculated as follows:

Emissions factors for sulfur oxide (SO) [MW = 48 grams/mole] and sulfur dioxide (SO_2) [MW = 64 grams/mole] were provided. To estimate the total sulfur dioxide emissions rate for each Round, the SO and SO_2 emissions rates were added together as shown in Tables E-6, E-7 and E-8.

Table E-6

Material Sulfur Oxide (SO)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Primer (FA-956)	0.454	21.79	0.38	1.183E-06
Propellant (WC-844)	0.006	0.29	28.5	1.173E-06
Tracer (R-284)	0.000	0.00	1.2	0.000E-00
Ignitor (I-560)	0.000	0.00	1.2	0.000E-00
Ignitor (I-561)	0.000	0.00	1.0	0.000E-00
Total with Tracer			**32.28**	**2.356E-06**
Total without Tracer			**31.08**	**2.356E-06**
TOTAL (Average Mix)			**31.32**	**2.356E-06**

Refer to the bottom of Table E-3 for definition of notes.

Table E-7

Material Sulfur Oxide (SO_2)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Primer (FA-956)	0.742	47.49	0.38	2.579E-06
Propellant (WC-844)	0.010	0.64	28.5	2.607E-06
Tracer (R-284)	0.000	0.00	1.2	0.000E-00
Ignitor (I-560)	0.000	0.00	1.2	0.000E-00
Ignitor (I-561)	0.000	0.00	1.0	0.000E-00
Total with Tracer			**32.28**	**5.185E-06**
Total without Tracer			**31.08**	**5.185E-06**
TOTAL (Average Mix)			**31.32**	**5.185E-06**

Refer to the bottom of Table E-3 for definition of notes.

Table E-8

Material Total Sulfur Oxide	moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Total with Tracer	$SO + SO_2$		32.28	7.542E-06
Total without Tracer	$SO + SO_2$		31.08	7.542E-06
TOTAL (Average Mix)	$SO + SO_2$		31.32	7.542E-06
Refer to the bottom of Table E-3 for definition of notes.				

E-2.4 Particulate Matter (PM)

The particulate matter (PM) emissions rate for 5.56 mm Round was calculated as shown in Table E-9:

Table E-9

Material	Moles/Kg (a)	MW Grams/Mole	Grains/Round (c)	Lbs/Round (d)
Primer (FA-956)				
- Al_2O_3 (L)	1.293	102.0	0.38	7.163E-06
- BaO (L)	0.770	153.4	0.38	6.414E-06
- Pb [##]	0.705	207.2	0.38	7.932E-06
- PbO [##]	0.066	223.2	0.38	8.000E-07
- PbS [##]	0.019	239.2	0.38	2.468E-07
Propellant (WC-844)				
- CaO (L)	0.022	56.1	28.5	5.027E-06
Tracer (R-284)				
- Mg	3.868	24.3	1.2	1.612E-05
- MgO (S)	6.947	40.3	1.2	4.801E-05
- SrO (S)	0.443	103.6	1.2	7.870E-06
Ignitor (I-560)				
- Mg	4.896	24.3	1.2	2.040E-05
- MgO (S)	6.173	40.3	1.2	4.266E-05
- SrO (S)	1.883	103.6	1.2	3.345E-05
Ignitor (I-561)				
- C	1.733	12.0	1.0	2.972E-06
- CaO (S)	0.103	56.1	1.0	8.257E-07
- Mg	3.677	24.3	1.0	1.277E-05
- MgO (S)	3.486	40.3	1.0	2.008E-05
- SrO (S)	5.945	103.6	1.0	8.801E-05
Total Particulate Matter Emissions Rate	With Tracer		32.28	3.208-04
	Without Tracer		31.08	2.488E-04
	Average Mix		31.32	2.632E-04

Table E-9 (Continued)

Material	Moles/Kg (a)	MW Grams/Mole	Grains/Round (c)	Lbs/Round (d)
Total Lead (Pb) Emissions Rate	With Tracer		32.28	8.979E-06
	Without Tracer		31.08	8.979E-06
	Average Mix		31.32	8.979E-06

[##] Lead (Pb) emissions due lead compounds released from Primer ((FA-956) material.

Refer to the bottom of Table E-3 for definition of notes.

E-3 Pollutant Emissions Analysis for 7.62 mm Round

The material type (i.e., propellant, ignitor, tracer mix) and amount (weight) used in each 7.62 mm Round are as shown in Table E-10:

Table E-10

Material Used per 7.62 mm Round	Weight [Grains (Gr)]
Primer Mix	0.00
Propellant Mix (WC-846)	46.00
Tracer Mix (R-284)	6.50
Ignitor Mix (I-136)	1.00
Ignitor Mix (I-280)	1.00

E-3.1 Carbon Monoxide (CO)

The carbon monoxide (CO) emissions rate for 7.62 mm Round was calculated as shown in Table E-11:

Table E-11

Material	Moles/Kg (a)	g/Kg (b)	Grains/Round (c)	Lbs/Round (d)
Primer	0.000	0.00	0.0	0.000E-00
Propellant (WC-846)	16.656	466.37	46.0	3.066E-03
Tracer (R-284)	3.947	110.52	6.5	1.027E-04
Ignitor (I-136)	5.482	153.50	1.0	2.194E-05
Ignitor (I-280)	3.874	108.47	1.0	1.550E-05
Total with Tracer			**54.5**	**3.206E-03**
Total without Tracer			**48.0**	**3.103E-03**
TOTAL (Average Mix)			**49.3**	**3.124E-03**

Refer to the bottom of Table E-3 for definition of notes.

The carbon monoxide (CO) emissions rate was calculated to be 3.124E-03 (0.003124) pounds for each 7.62 Round fired based on the assumption that every fifth Round contains a Tracer mix.

E-3.2 Nitrogen Oxides (NO_x)

The nitrogen oxides (NO_x) emissions rate for 7.62 mm Round was calculated as shown in Table E-12:

Table E-12

Material Nitrogen Oxide (NO)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Primer	0.000	0.00	0.0	0.000E-00
Propellant (WC-846)	0.000	0.00	46.0	0.000E-00
Tracer (R-284)	0.063	1.89	6.5	0.000E-00
Ignitor (I-136)	0.000	0.00	1.0	1.756E-06
Ignitor (I-280)	0.000	0.00	1.0	0.000E-00
Total with Tracer	**NO**		**54.5**	**1.756E-06**
Total without Tracer	**NO**		**48.0**	**0.000E-00**
TOTAL (Average Mix)	**NO**		**49.3**	**3.511E-07**

Refer to the bottom of Table E-3 for definition of notes.

Nitrogen oxides (NO_x) emissions include nitrogen oxide (NO) and nitrogen dioxide (NO_2). No emissions factor (moles/Kg) was provided for nitrogen dioxide (NO_2). In calculating pollutant emissions rates, NO emissions are assumed to be oxidized to NO_2 in the atmosphere. Therefore, NO emissions are treated as NO_2 emissions for air quality assessment analyses. For this study, the NO emissions rates were scaled by 1.53 (the NO_2/NO molecular weight ratio) to estimate a nitrogen oxides (NO_x) emissions rate as shown in Table E-13:

NO_x Emissions Rate = NO Emissions Rate x 46/30

Table E-13

Material Nitrogen Oxide (NO_x)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Total with Tracer	NO_x		54.5	2.692E-06
Total without Tracer	NO_x		48.0	0.000E-00
TOTAL (Average Mix)	NO_x		49.3	5.384E-07

Refer to the bottom of Table E-3 for definition of notes.

E-3.3 Sulfur Dioxide (SO_2)

The sulfur dioxide (SO_2) emissions rate for 7.62 mm Round was calculated as follows:

Emissions factors for sulfur oxide (SO) [MW = 48 grams/mole] and sulfur dioxide (SO_2) [MW = 64 grams/ mole] were provided. To estimate the total sulfur dioxide emissions rate for each Round, the SO and SO_2 emissions rates were added together as shown in Tables E-14, E-15, and E-16.

Table E-14

Material Sulfur Oxide (SO)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Primer	0.000	0.00	0.0	0.000E-00
Propellant (WC-846)	0.034	1.63	46.0	1.073E-05
Tracer (R-284)	0.000	0.00	6.5	0.000E-00
Ignitor (I-136)	0.000	0.00	1.0	0.000E-00
Ignitor (I-280)	0.000	0.00	1.0	0.000E-00
Total with Tracer			**54.5**	**1.073E-05**
Total without Tracer			**48.0**	**1.073E-05**
TOTAL (Average Mix)			**49.3**	**1.073E-05**

Refer to the bottom of Table E-3 for definition of notes.

Table E-15

Material Sulfur Oxide (SO_2)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Primer	0.000	0.00	0.0	0.000E-00
Propellant (WC-846)	0.112	7.17	46.0	4.712E-05
Tracer (R-284)	0.000	0.00	6.5	0.000E-00
Ignitor (I-136)	0.000	0.00	1.0	0.000E-00
Ignitor (I-280)	0.000	0.00	1.0	0.000E-00
Total with Tracer			**54.5**	**4.712E-05**
Total without Tracer			**48.0**	**4.712E-05**
TOTAL (Average Mix)			**49.3**	**4.712E-05**

Refer to the bottom of Table E-3 for definition of notes.

Table E-16

Material Total Sulfur Oxide	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Total with Tracer	SO + SO_2		54.5	5.785E-05
Total without Tracer	SO + SO_2		48.0	5.785E-05
TOTAL (Average Mix)	SO + SO_2		49.3	5.785E-05

Refer to the bottom of Table E-3 for definition of notes.

E-3.4 Particulate Matter (PM)

The particulate matter (PM) emissions rate for 7.62 mm Round was calculated as shown in Table E-17:

Table E-17

Material	Moles/Kg (a)	MW Grams/Mole	Grains/Round (c)	Lbs/Round (d)
Primer	-	-	-	-
Propellant (WC-846)				
- CaS (L)	0.025	78.1	46.0	1.283E-05
Tracer (R-284)				
- Mg	3.868	24.3	6.5	8.731E-05
- MgO (S)	6.947	40.3	6.5	2.601E-04
- SrO (S)	0.443	103.6	6.5	4.263E-05
Ignitor (I-136)				
- CaO	0.156	56.1	1.0	1.251E-06
- SrO_2H_2 (L)	0.000	121.6	1.0	0.000E-00
- SrO (S)	7.524	103.6	1.0	1.114E-04
Ignitor (I-280)				
- C	1.407	12.0	1.0	2.413E-06
- CaO (S)	0.112	56.1	1.0	8.979E-07
- Mg	2.990	24.3	1.0	1.038E-05
- MgO (S)	3.150	40.3	1.0	1.814E-05
- SrO (S)	6.182	103.6	1.0	9.152E-05
Total Particulate Matter Emissions Rate	With Tracer		32.28	6.388E-04
	Without Tracer		31.08	2.488E-04
	Average Mix		31.32	3.268E-04
Total Lead (Pb) Emissions Rate	With Tracer		32.28	0.000E-00
	Without Tracer		31.08	0.000E-00
	Average Mix		31.32	0.000E-00
Refer to the bottom of Table E-3 for definition of notes.				

E-4 Pollutant Emissions Analysis for 0.50 caliber Rounds

The material type (i.e., propellant, ignitor, tracer mix) and amount (weight) used in the M33 Ball and M17 Tracer 0.50 caliber Round are as shown in Table E-18:

Table E-18

Material Used per 0.50 caliber Round	M33 Ball Round Weight [Grains (Gr)]	M17 Tracer Round Weight [Grains (Gr)]
Propellant (WC-860) or	235.0	0.0
Propellant Mix (IMR-5010)	235.0	225.0

Table E-18 (Continued)

Material Used per 0.50 caliber Round	M33 Ball Round Weight [Grains (Gr)]	M17 Tracer Round Weight [Grains (Gr)]
Tracer Mix (R-284)	0.0	40.0
Ignitor Mix (I-136)	0.0	14.0
Ignitor Mix (I-280)	0.0	15.0

E-4.1 Carbon Monoxide (CO)

The carbon monoxide (CO) emissions rate for 7.62 mm Round was calculated as shown in Table E-19:

Table E-19

Material	moles/Kg (a)	g/Kg (b)	Grains/Round (c)	Lbs/Round (d)
Propellant (IMR-5010)	19.780	553.84	235.0	1.860E-02
Propellant (WC-860)	20.942	586.38	235.0	1.969E-02
Tracer (R-284)	3.947	110.52	40.0	6.317E-04
Ignitor (I-136)	5.482	153.50	14.0	3.071E-04
Ignitor (I-280)	3.874	108.47	15.0	2.325E-04
Total with Tracer			**294.0**	**2.003E-02**
Total without Tracer			**235.0**	**1.939E-02**
TOTAL (Average Mix)			**246.8**	**1.952E-02**
Refer to the bottom of Table E-3 for definition of notes.				

The carbon monoxide (CO) emissions rate was calculated to be 1.952E-02 (0.01952) pounds for each 0.50 caliber Round fired based on the assumption that every fifth Round contains a Tracer mix.

E-4.2 Nitrogen Oxides (NO_x)

The nitrogen oxides (NO_x) emissions rate for 0.50 caliber Round was calculated as shown in Table E-20:

Table E-20

Material Nitrogen Oxide (NO)	Moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Propellant (IMR-5010)	0.001	0.03	235.0	1.007E-06
Propellant (WC-860)	0.000	0.00	235.0	0.000E-00
Tracer (R-284)	0.063	1.89	40.0	1.080E-05
Ignitor (I-136)	0.000	0.00	14.0	0.000E-00
Ignitor (I-280)	0.000	0.00	15.0	0.000E-00
Total with Tracer			**294.0**	**1.177E-05**
Total without Tracer			**235.0**	**1.007E-06**
TOTAL (Average Mix)	**NO**		**246.8**	**3.160E-06**
Refer to the bottom of Table E-3 for definition of notes.				

Nitrogen oxides (NO_x) emissions include nitrogen oxide (NO) and nitrogen dioxide (NO_2). No emissions factor (moles/Kg) was provided for nitrogen dioxide (NO_2). In calculating pollutant emissions rates, NO emissions are assumed to be oxidized to NO_2 in the atmosphere. Therefore, NO emissions are treated as NO_2 emissions for air quality assessment analyses. For this study, the NO emissions rates were scaled by 1.53 (the NO_2/NO molecular weight ratio) to estimate a nitrogen oxides (NO_x) emissions rate as shown in Table E-21:

NO_x Emissions Rate = NO Emissions Rate x 46/30

Table E-21

Material Nitrogen Oxide (NO_x)	moles/Kg (a)	g/Kg (b)	Grains/ Round (c)	Lbs/Round (d)
Total with Tracer	NO_x		294.0	1.804E-05
Total without Tracer	NO_x		235.0	1.545E-06
TOTAL (Average Mix)	NO_x		246.8	4.845E-06
Refer to the bottom of Table E-3 for definition of notes.				

E-4.3 Sulfur Dioxide (SO_2)

The sulfur dioxide (SO_2) emissions rate for 0.50 caliber Round was calculated as follows:

Emissions factors for sulfur oxide (SO) [MW = 48 grams/mole] and sulfur dioxide (SO_2) [MW = 64 grams/mole] were provided. To estimate the total sulfur dioxide emissions rate for each Round, the SO and SO_2 emissions rates were added together as shown in Tables E-22, E-23 and E-24.

Table E-22

Material **Sulfur Oxide (SO)**	**Moles/Kg (a)**	**g/Kg (b)**	**Grains/ Round (c)**	**Lbs/Round (d)**
Propellant (IMR-5010)	0.009	0.43	235.0	1.451E-05
Propellant (WC-860)	0.001	0.05	235.0	1.612E-06
Tracer (R-284)	0.000	0.00	40.0	0.000E-00
Ignitor (I-136)	0.000	0.00	14.0	0.000E-00
Ignitor (I-280)	0.000	0.00	15.0	0.000E-00
Total with Tracer			**294.0**	**1.389E-05**
Total without Tracer			**235.0**	**1.451E-05**
TOTAL (Average Mix)	NO		**246.8**	**1.438E-05**
Refer to the bottom of Table E-3 for definition of notes.				

Table E-23

Material **Sulfur Oxide (SO_2)**	**Moles/Kg (a)**	**g/Kg (b)**	**Grains/ Round (c)**	**Lbs/Round (d)**
Propellant (IMR-5010)	0.014	0.90	235.0	3.009E-05
Propellant (WC-860)	0.001	0.13	235.0	4.299E-06
Tracer (R-284)	0.000	0.00	40.0	0.000E-00
Ignitor (I-136)	0.000	0.00	14.0	0.000E-00
Ignitor (I-280)	0.000	0.00	15.0	0.000E-00
Total with Tracer			**294.0**	**2.881E-05**
Total without Tracer			**235.0**	**3.009E-05**
TOTAL (Average Mix)	NO		**246.8**	**2.983E-05**
Refer to the bottom of Table E-3 for definition of notes.				

Table E-24

Material **Total Sulfur Oxide**	**Moles/Kg (a)**	**g/Kg (b)**	**Grains/ Round (c)**	**Lbs/Round (d)**
Total with Tracer	SO + SO_2		295.0	4.270E-05
Total without Tracer	SO + SO_2		235.0	4.460E-05
TOTAL (Average Mix)	SO + SO_2		246.8	4.422E-05
Refer to the bottom of Table E-3 for definition of notes.				

E-4.4 Particulate Matter (PM)

The particulate matter (PM) emissions rate for 0.50 caliber Round was calculated as shown in Table E-25:

Table E-25

Material		Moles/Kg (a)	MW Grams/Mole	Grains/Round (c)	Lbs/Round (d)
Propellant (IMR-5010)		-	-	-	-
Propellant (WC-860)					
- CaO (L)		0.100	56.1	235.0	1.884E-04
Tracer (R-284)					
- Mg		3.868	24.3	40.0	5.373E-04
- MgO (S)		6.947	40.3	40.0	1.600E-03
- SrO (S)		0.443	103.6	40.0	2.623E-04
Ignitor (I-136)					
- CaO (S)		0.156	56.1	14.0	1.751E-05
- SrO_2 H_2 (L)		0.000	121.6	14.0	0.000E-00
- SrO (S)		7.524	103.6	14.0	1.559E-03
Ignitor (I-280)					
- C		1.407	12.0	15.0	3.619E-05
- CaO (S)		0.112	56.1	15.0	1.347E-05
- Mg		2.990	24.3	15.0	1.557E-04
- MgO (S)		3.150	40.3	15.0	2.721E-04
- SrO (S)		6.182	103.6	15.0	1.373E-03
Total Particulate Matter Emissions Rate		With Tracer		294.0	6.008E-03
		Without Tracer		235.0	3.616E-03
		Average Mix		246.8	4.094E-03
Total Lead (Pb) Emissions Rate		With Tracer		294.0	0.000E-00
		Without Tracer		235.0	0.000E-00
		Average Mix		246.8	0.000E-00
Refer to the bottom of Table E-3 for definition of notes.					

E-5 Summary of FY 1994 Small Arms Emissions

The estimated annual pollutant emissions (pounds per year) due to Small Arms firing in FY 1994 is provided below in Tables E-26 and E-27. Pollutant emissions rates for the other smaller caliber arms fired at Camp Edwards were conservatively estimated by assuming that each round produced the same amount of pollutants as released into the atmosphere when a 5.56 mm round was fired.

Table E-26

Small Arms Rounds - Type	5.56 mm Rounds	7.62 mm Rounds	0.50 caliber Rounds	Other Rounds	Total Rounds
FY 1994 Rounds Utilization	786,509	287,462	38,830	664,557	1,777,358

Table E-27

Small Arms Type	5.56 mm Rounds	7.62 mm Rounds	0.50 caliber Rounds	Other Rounds	Total Rounds
Pollutant	lbs/Year	lbs/Year	lbs/Year	lbs/Year	lbs/Year
Carbon Monoxide	1,746.4	897.9	758.0	1,475.6	4,877.9
Nitrogen Oxides	0.2	0.2	0.2	0.2	0.7
Total Sulfur Oxides	5.9	16.6	1.7	5.0	29.3
Particulate Matter	207.0	94.0	159.0	174.9	634.8
Lead	7.1	0.0	0.0	6.0	13.0

E-6 Summary of FY 2000 Small Arms Emissions

The projected annual pollutant emissions (pounds per year) due to Small Arms firing in FY 2000 are provided below in Tables E-28 and E-29. Pollutant emissions rates for the other smaller caliber arms fired at Camp Edwards were conservatively estimated by assuming that each round produced the same amount of pollutants as released into the atmosphere when a 5.56 mm round was fired.

Table E-28

Small Arms Rounds - Type	5.56 mm Rounds	7.62 mm Rounds	0.50 caliber Rounds	Other Rounds	Total Rounds
FY 2000 Rounds Utilization	2,569,099	709,611	169,412	231,432	3,679,554

Table E-29

Small Arms Type	5.56 mm Rounds	7.62 mm Rounds	0.50 caliber Rounds	Other Rounds	Total Rounds
Pollutant	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**
Carbon Monoxide	5,704.5	2,216.6	3,306.9	513.9	11,741.9
Nitrogen Oxides	0.7	0.4	0.8	0.1	1.9
Total Sulfur Oxides	19.4	41.0	7..5	1.7	69.7
Particulate Matter	676.1	231.9	693.6	60.9	1,662.5
Lead	23.1	0.0	0.0	2.1	25.1

E-7 Pollutant Emissions Calculations for Artillery and Mortar Rounds

E-7.1 Analysis for 155mm Howitzer Rounds

Table E-30

Material Used per Mortar Round	Pounds (lbs)
lbs/Round	6.80

Table E-31

Pollutants	Symbol	lbs. Pollutant/Round
Carbon Monoxide	CO	9.520E-06
Nitrogen Oxides	NO_x	2.405E-02
Total Sulfur Oxides	SO_2	+
Particulate Matter ++	PM	6.533E-05
Lead	Pb	0.00

+ No emissions rates available for sulfur compounds.
++ Particulate matter emissions rate was calculated from the sum of the estimated carbon product emissions rates.

E-7.2 Analysis for 81 mm Mortar Rounds

Table E-32

Material Used per Mortar Round	Pounds (lbs)
Explosive	1.724
Propellant	5.451
Ignitor Mix	0.019
Total (lbs/Round)	7.194

Table E-33

Pollutants	Symbol	lbs. Pollutant/Round
Carbon Monoxide	CO	2.8580E+00
Nitrogen Oxides	NO_x	3.660E-08
Total Sulfur Oxides	SO_2	+
Particulate Matter	PM	+
Lead	Pb	+

+ No emissions rates available for sulfur and particulate compounds.

E-7.3 Analysis for 60 mm Mortar Rounds

No emissions rates were available for the 60 mm Mortar Rounds. Pollutant emissions rates for the 60 mm Mortar Rounds fired at Camp Edwards were conservatively estimated by assuming that each round produced the same amount of pollutants as a 81 mm Mortar Round.

E-7.4 Analysis for 4.2 inch Mortar Rounds

No emissions rates were available for the 4.2 inch Mortar Rounds. Pollutant emissions rates for the 4.2 inch Mortar Rounds fired at Camp Edwards were conservatively estimated by assuming that each round produced the same amount of pollutants as a 81 mm Mortar Round.

E-7.5 Analysis for 120 mm Mortar Rounds

No emissions rates were available for the 120 mm Mortar Rounds. Pollutant emissions rates for the 120 mm Mortar Rounds fired at Camp Edwards were conservatively estimated by assuming that each round produced the same amount of pollutants as a 155 mm Howitzer Round.

E-8 Summary of FY 1994 Artillery and Mortar Emissions

The annual pollutant emissions (pounds per year) due to Artillery and Mortar firing in FY 1994 are provided below.

Table E-34

Artillery/ Mortar Types	60 mm Mortar	81 mm Mortar HE	81 mm Mortar IL	4.2 inch Mortar	155 mm Howitzer	Total Rounds
FY 1994 Utilization	259	2,205	43	311	363	3,181

Table E-35

Artillery/Mortar Types	60 mm Mortar	81 mm Mortar HE	81 mm Mortar IL	4.2 inch Mortar	155 mm Howitzer	Total Rounds
Pollutant	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**
Carbon Monoxide	740.3	6,302.9	122.9	889.0	0.0	8,055.1
Nitrogen Oxides	0.0	0.0	0.0	0.0	8.7	8.7
Total Sulfur Oxides	0.0	0.0	0.0	0.0	0.0	0.0
Particulate Matter	0.0	0.0	0.0	0.0	0.0	0.0
Lead	0.0	0.0	0.0	0.0	0.0	0.0

E-9 Summary of FY 2000 Artillery and Mortar Emissions

The annual pollutant emissions (pounds per year) due to Artillery and Mortar firing in FY 2000 are provided below.

Table E-36

Artillery/ Mortar Types	60 mm Mortar	81 mm Mortar HE	81 mm Mortar IL	120 mm Mortar	155 mm Howitzer	Total Rounds
FY 2000 Projection	1,007	630	37	113	1,304	3,091

Table E-37

Artillery/ Mortar Types	60 mm Mortar	81 mm Mortar HE	81 mm Mortar IL	120 mm Mortar	155 mm Howitzer	Total Rounds
Pollutant	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**	**lbs/Year**
Carbon Monoxide	2,878.5	1,800.8	105.8	0.0	0.0	4,785.1
Nitrogen Oxides	0.0	0.0	0.0	2.7	31.4	34.1
Total Sulfur Oxides	0.0	0.0	0.0	0.0	0.0	0.0
Particulate Matter	0.0	0.0	0.0	0.0	0.1	0.1
Lead	0.0	0.0	0.0	0.0	0.0	0.0

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APPENDIX E-2

AIR QUALITY
CANTONMENT PROJECT
EMISSIONS CALCULATIONS

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APPENDIX E-2
CANTONMENT PROJECT EMISSIONS CALCULATIONS

Table 1
Estimated Emissions from Proposed Cantonment Area Projects *

Proposed Facility	Annual Pollutant Emissions (lbs/year) +						
	Annual Fuel (MMCF/year)	VOC	NO_2	CO	SO_2	PM	Lead
UTES	9.24	35.3	924.2	194.1	5.5	110.9	0.0
Airfield Control Tower	2.47	9.5	247.0	51.9	1.5	29.6	0.0
AGU Facility	4.89	18.7	489.0	102.7	2.9	58.7	0.0
Fire Station	5.26	20.1	526.0	110.5	3.2	63.1	0.0
Environmental Facility	3.15	12.1	315.0	66.1	1.9	37.8	0.0
Total		**95.7**	**2,501.2**	**525.3**	**15.0**	**300.1**	**0.0**

* These emissions will replace similar emissions associated with existing operations. The net project-related emissions increase will be significantly less than the estimated emissions in this table.

+ USEPA air pollutant emissions factors (AP-42) were used to estimate emissions based upon natural gas boiler capacities for facilities. Annual emissions assumes boiler operation for 8,760 hours per year.

Note: The following emissions factors in pounds per million cubic feet of natural gas (lbs/MMCF) were used to estimate Cantonment Project emissions:

VOCs - 3.83 MMCF (factor based on Otis ANGB 1993 Air Emissions Inventory - MAANG, 1995a).
NO_2 - 100.00 (factor based on USEPA AP42)
CO - 21.00 (factor based on USEPA AP42)
SO_2 - 0.60 (factor based on USEPA AP42)
PM - 12.00 (factor based on USEPA AP42)
Lead - Lead emissions due to combustion of natural gas are insignificant (factor based on USEPA AP42).

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APPENDIX E-3

AIR QUALITY
INDIRECT (MOBILE SOURCE) EMISSIONS CALCULATIONS

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APPENDIX E-3
INDIRECT (MOBILE SOURCE) EMISSIONS CALCULATIONS

1.0 Total Annual Miles

Total annual miles travelled by the net project-related vehicle increase was used to estimate criteria pollutant emissions. The methodology used to calculate these emissions is presented below.

Military MRM = [(PVI * MDU * MDT) + (PVI * ATU * ATT)] * CS
Civilian MRM = (PCVI * CTT)] * CS

MRM = Maximum miles travelled by projected annual vehicle trips increase.

PVI = Projected annual vehicle trips increase (calculated as shown below).

MDU = % total annual inactive duty (weekend) training utilization.

MDT = Inactive duty training maximum travel time (25% of training time).

ATU = % total annual training utilization (two weeks/year).

ATT = Annual training maximum travel time (25% of training time).

PCVI = Projected civilian vehicle trips increase.

CTT = Civilian travel time

CS = Convoy speed.

Calculation of PVI

Total project-related utilization increase (FY2000 utilization - FY1994 utilization):

MRFR: FY2000 (7483) - FY1994 (7778) =- 295
MPMR: FY2000 (939) - FY1994 (1022) =- 83
ISBC: FY2000 (810) - FY1994 (450) = 360
MOUT-MAC: FY2000 (4853) - FY1994 (0) = 4853
MOUT-CTF: FY2000 (3473) - FY1994 (0) = 3473
Total = 8308 soldiers/civilians

Total military: 4962
Total civilians: 3346 (1673 at each MOUT facility)

Military PVI:

Assume 75% convoy vehicles and 2 soldiers/vehicle
Assume 25 % POVs and 1 soldier/vehicle

(4962 * .75)/2 =	1861 vehicle trips
(4962 * .25)/1 =	1240 vehicle trips
Total	3101 vehicle trips

Civilian PVI:

(3346 * 1)/1 = 3346 vehicle trips

Calculation of MRM

For purposes of this EIS/EIR:

PVI (military) = 3101 vehicle trips
MDU = 67%
MDT = 4 hours
ATU = 33%
ATT = 45 hours
CTT = 4 hour round trip (average)
CS = 50 miles per hour (mph)

Military MRM

[(PVI * MDU * MDT) + (PVI * ATU * ATT)] * CS

[(3101 * .67 * 4)hours + (3101 * .33 * 45)hours] * 50 mph = 2,718,027 miles

Civilian MRM

(PCVI * CTT)] * CS

(3346 * 4)hours * 50 mph = 669,200

Total Annual Miles

2,718,027 + 669,200 = 3,387,227 miles

2.0 Total Annual Project-Related Criteria Pollutant Emissions

Standard emissions factors for each criteria pollutant were applied to the MRM to calculate the total annual criteria pollutant emissions. The calculations provided below represent the estimated total criteria pollutant emissions associated with the net project-related traffic increase. Standard emissions factors from USEPA's AP42 for light duty diesel trucks (convoy vehicles) and POVs were applied. Approximately 75% of Military MRM was assumed to be convoy vehicle miles and the remaining 25% assumed to be POV miles. Civilian MRM was assumed to be 100% POV. The following formulas were used to calculate annual pounds of pollutant emissions:

Total Convoy Miles: 2,718,027 *.75 = 2,038,520 miles
Total POV Miles: (2,718,027 * .25) + 669,200 = 1,348,707 miles
3,387,227 miles

Convoy: MRM miles * standard emissions factor (grams/mile) * 0.002205 grams/pound = annual pounds of pollutant

POV: MRM miles * standard emissions factor (grams/mile) * 0.002205 grams/pound = annual pounds of pollutant

Volatile Organic Compounds

Convoy: 2038520 * 0.600 * 0.002205 = 2697lbs

POV: 1348707 * 2.470 * 0.002205 = 7346 lbs
10043 lbs

Nitrogen Dioxide

Convoy: 2038520 * 1.210 * 0.002205 = 5439 lbs

POV: 1348707 * 1.640 * 0.002205 = 4877 lbs
10316 lbs

Carbon Monoxide

Convoy: 2038520 * 1.520 * 0.002205 = 6832 lbs

POV: 1348707 * 16.58 * 0.002205 = 49307 lbs
56139 lbs

Sulfur Dioxide

A standard grams/mile emissions factor was not available. A factor of 8.75 grams/gallon (from USEPA's AP 42) and a fuel efficiency of 15 miles/gallon was used instead.

Convoy: (2038520/15 * 8.75 * 0.002205 = 2622 lbs

POV: (1348707/15 * 8.75 * 0.002205 = 1735 lbs
4357 lbs

Particulate Matter

Convoy: 2038520 * 0.260 * 0.002205 = 1169 lbs

POV: 1348707 * 0.078 * 0.002205 = 232 lbs
1401 lbs

Lead

Convoy: 2038520 * 0.0132 * 0.002205 = 59 lbs

POV: 1348707 * 0.0132 * 0.002205 = 39 lbs
98 lbs

APPENDIX E-4

AIR QUALITY
CONSTRUCTION-RELATED EMISSIONS

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APPENDIX E-4

POLLUTANT EMISSION RATE CALCULATIONS FOR CONSTRUCTION ACTIVITIES

I. ASSUMPTIONS

The following assumption were made for estimating construction emissions:

(1) All 10 project will be constructed during the same time period.
(2) Construction will take place over a three-month period during weekdays only (a total of 65 work days). Each work day is 8 hours.
(3) For the Range Projects, it was assumed that clearing and grading of wooded lots is required.
(4) All soil will remain on site at each project location.
(5) For Cantonment Projects, clearing/grading was assumed to be required for flat, grassy lots.
(6) The following areas will need to be cleared/graded for construction purposes:

Range Projects:	MRFR -	1.5 Acres
	MPMR -	1.2 Acres
	ISBC -	2.0 Acres
	MOUT-MAC -	10.0 Acres
	MOUT-CTFM -	8.0 Acres
	Total Range Projects	**22.7 Acres**
Cantonment Projects:	UTES -	10.0 Acres
	Control Tower -	0.5 Acres
	AGU -	0.0 Acres
	Fire Station -	0.0 Acres
	Environ. Facility -	0.5 Acres
	Total Cantonment Projects	**11.0 Acres**

II. HEAVY CONSTRUCTION OPERATIONS

Land clearing, ground excavation, and building and road construction result in temporary short-term particulate emissions. The quantity of particulate emissions from construction operations is proportional to the area of land and the level of construction activity. USEPA's AP-42 document (USEPA, 1995) presents a relatively straightforward method to conservatively estimate particulate emissions. For heavy construction operations, AP-42 provides the following particulate emission factor:

E = 1.2 Tons Particulate Matter/Acre/Month of Activity

AP-42 states that the above emission factor was derived from limited field studies measuring TSP and the use of this emission factor to estimate particulate matter (PM) no greater than 10 um in aerodynamic diameter (PM-10) will result in conservatively high estimates. No control measures were assumed in the following calculations.

Total Project Construction Emission Rates:

Total Range Projects -

E = 1.2 (22.7 Acres) (3 Months) = 81.7 Tons/Construction

Total Cantonment Projects -

E = 1.2 (11.0 Acres) (3 Months) = 39.6 Tons/Construction

Total Range + Cantonment Projects - 121.3 Tons/Construction

III. HEAVY CONSTRUCTION EQUIPMENT OPERATIONS

The following heavy construction equipment and duration of use was assumed per Project type:

Range Projects	AP-42 Equivalent	Days
Backhoe/Loader	Wheeled Loader	45.0
Steamroller	Roller	20.0
Bulldozer	Wheeled Tractor	45.0
Grader	Scraper	20.0
Dump Truck	Off-Highway Truck	20.0

Cantonment Projects	AP-42 Equivalent	Days
Backhoe/Loader	Wheeled Loader	50.0
Steamroller	Roller	10.0
Bulldozer	Wheeled Tractor	10.0
Grader	Scraper	5.0
Dump Truck	Off-Highway Truck	30.0
Paver	Roller	3.0
Crane	Miscellaneous	20.0
Concrete Truck	Off-Highway Truck	5.0
Asphalt Truck	Off-Highway Truck	5.0

Based on AP-42 emission factors for diesel powered construction equipment, pollutant emissions were calculated based on the type of construction equipment used and the estimated use.

(A) Range Projects	Emission Factors (lb/hr) Diesel Powered Construction Equipment				
Equipment (AP-42 Equivalent)	CO	VOCs	NOx	SO2	PM
Backhoe/Loader (Wheeled Loader)	0.572	0.250	1.890	0.182	0.172
Steamroller (Roller)	0.304	0.067	0.862	0.067	0.050
Bulldozer (Wheeled Tractor)	3.590	0.188	1.269	0.090	0.136
Grader (Scraper)	1.257	0.282	3.840	0.463	0.406
Dump Truck (Off-Highway Truck)	1.794	0.192	4.166	0.454	0.256

Range Projects	Project Emissions (lbs/Project)				
Equipment (AP-42 Equivalent)	CO	VOCs	NOx	SO2	PM
Backhoe/Loader (Wheeled Loader)	205.9	90.0	680.4	65.5	61.9
Steamroller (Roller)	48.6	10.7	137.9	10.7	8.0
Bulldozer (Wheeled Tractor)	1292.4	67.7	456.8	32.4	49.0
Grader (Scraper)	201.1	45.1	614.4	74.1	65.0
Dump Truck (Off-Highway Truck)	287.0	30.7	666.6	72.6	41.0
Range Total (lbs/Project)	2035.1	244.2	2556.1	255.4	224.8
Projects Total (Tons/Project)	1.02	0.12	1.28	0.13	0.11

(B) Cantonment Projects	Emission Factors (lb/hr)	Diesel Powered Construction Equip.			
Equipment (AP-42 Equivalent)	CO	VOCs	NOx	SO2	PM
Backhoe/Loader (Wheeled Loader)	0.572	0.250	1.890	0.182	0.172
Steamroller (Roller)	0.304	0.067	0.862	0.067	0.050
Bulldozer (Wheeled Tractor)	3.590	0.188	1.269	0.090	0.136
Grader (Scraper) Scraper	1.257	0.282	3.840	0.463	0.406
Dump Truck (Off-Highway Truck)	1.794	0.192	4.166	0.454	0.256
Paver (Roller)	0.304	0.067	0.862	0.067	0.050
Crane (Miscellaneous)	0.675	0.152	1.691	0.143	0.139
Concrete Truck (Off-Highway Truck)	1.794	0.192	4.166	0.454	0.256
Asphalt Truck (Off-Highway Truck)	1.794	0.192	4.166	0.454	0.256

Cantonment Projects	Project Emissions (lbs/Project)				
Equipment (AP-42 Equivalent)	CO	VOCs	NOx	SO2	PM
Backhoe/Loader (Wheeled Loader)	228.80	100.00	756.00	72.80	68.80
Steamroller (Roller)	24.32	5.36	68.96	5.36	4.00
Bulldozer (Wheeled Tractor)	287.20	15.04	101.52	7.20	10.88
Grader (Scraper) Scraper	50.28	11.28	153.60	18.52	16.24
Dump Truck (Off-Highway Truck)	430.56	46.08	999.84	108.96	61.44
Paver (Roller)	7.30	1.61	20.69	1.61	1.20
Crane (Miscellaneous)	108.00	24.32	270.56	22.88	22.24
Concrete Truck (Off-Highway Truck)	71.76	7.68	166.64	18.16	10.24
Asphalt Truck (Off-Highway Truck)	71.76	7.68	166.64	18.16	10.24
Cantonment Total (lbs/Project)	1279.98	219.05	2704.45	273.65	205.28
Projects Total (Tons/Project)	0.64	0.11	1.35	0.14	0.10

IV. Summary - Total Project Pollutant Emissions for Construction Activities

Summary - Total Project Emissions due to Construction Activities					
	CO	VOCs	NOx	SO2	PM
Equipment - Range Projects (lbs.)	2035.1	244.2	2556.1	255.4	224.8
Total Projects (Tons)	1.02	0.12	1.28	0.13	0.11
Equip. - Cantonment (lbs./Project)	1280.0	219.0	2704.4	273.6	205.3
Total Projects (Tons)	0.64	0.11	1.35	0.14	0.10
Range + Cantonment Projects (lbs.)	3315.1	463.3	5260.6	529.0	430.1
Equipment - Total Projects (Tons)	1.66	0.23	2.63	0.26	0.22
Construction - All Projects (lbs.)	0	0	0	0	242600
Operations - Total (Tons)	0	0	0	0	121.3
Total All Construction Activities (lbs)	3315.1	463.3	5260.6	529.0	243030.1
All Projects (tons)	1.66	0.23	2.63	0.26	121.52

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APPENDIX E-5

AIR QUALITY
MASSACHUSETTS MILITARY RESERVATION
FACILITIES UPGRADE
RECORD OF NON-APPLICABILITY

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APPENDIX E-5
AIR QUALITY
MASSACHUSETTS MILITARY RESERVATION FACILITIES UPGRADE
RECORD OF NON-APPLICABILITY
GENERAL CONFORMITY RULE

Conformity under the Clean Air Act, Section 176 has been evaluated for the above project per 40 CFR 51. This project/action is exempt from the requirements of this rule because the total net direct and indirect (mobile source) emissions of criteria pollutants (including estimated emissions associated with mortar and artillery firing, and other small arms range activities not associated with the 10 proposed projects) are below the de minimis threshold levels specified in 40 CFR 51.853(b). Project-related direct and indirect emissions are presented in Table I and in Section 4.12.1 of this EIS/EIR. Construction-related emissions are presented in Table 2. The methodology and sample calculations for estimating Range Project, Cantonment Project, mobile source, and construction-related emissions are presented in this EIS/EIR in Appendices E-1, E-2, E-3, and E-4 respectively.

This project/action is not considered "regionally significant" (as defined by 40 CFR 51.853(i) because the total emissions of ozone precursors is less than 10% of the total emissions of ozone precursors within the Southeastern Massachusetts Air Quality Control Region.

The supporting documentation and emissions estimates are:

(XX) Attached
(XX) Attached to NEPA Document (MMR Facilities Upgrade EIS/EIR)
( ) Other

Environmental Coordinator

ATTACHMENT I

Table 1
Total Estimated Air Pollutant Emissions Change from FY 1994 to FY 2000 *

Proposed Facility	Annual Pollutant Emissions (lbs/year) +					
	VOC	NO_x	CO	SO_2	PM	Lead
Small Arms, and Mortar and Artillery Ranges	0.0	26.6	3,594.0	40.4	1,027.8	12.1
Cantonment Projects	95.7	2,501.2	525.3	15.0	300.1	0.0
Indirect (Mobile Source) Emissions	10,043.0	10,316.0	56,139.0	4,357.0	1,401.0	98.0
Net Change from Baseline (lbs/year)	10,138.7	12,843.8	60,258.3	4,412.4	2,728.9	110.1
De Minimis Levels (lbs/years)	100,000	100,000	200,000	200,000	200,000	50,000

* These emissions will replace similar emissions associated with existing operations. The net project-related emissions increase will be significantly less than the estimated emissions in this table.

+ USEPA air pollutant emissions factors (AP-42) were used to estimate emissions based upon natural gas boiler capacities for facilities. Annual emissions assumes boiler operation for 8,760 hours per year.

Note: Information from this table is based on the methodology and calculations presented in Appendices E-1, E-2 and E-3 of the attached EIS/EIR.

This table does not include construction-related emissions.

Table 2
Construction-Related Emissions (Tons) *

Proposed Projects	VOC	NO_x	CO	SO_2	PM	Lead
Range Projects	0.1	1.3	1.0	0.1	81.8	0.0
Cantonment Projects	0.1	1.4	0.6	0.1	39.7	0.0
Total	**0.2**	**2.6**	**1.7**	**0.3**	**121.5**	**0.0**

* Emissions factors used to estimate construction-related emissions calculations are based on USEPAs AP-42 document (USEPA, 1995).

Note: Information from this table is based on the methodology and calculations presented in Appendix E-4 of the attached EIS/EIR.

The emissions shown in Table 2 represent a worst-case scenario because all 10 projects were assumed to be constructed simultaneously over a three-month period. It is unlikely all 10 projects will be constructed simultaneously. Construction activities will most likely take place over several years. In addition, PM10 emissions presented in Table 2 do not account for mitigating measures such as use of watering trucks, prohibiting construction during periods of high wind, and covering and stabilizing unused storage piles. These measures will reduce PM10 emissions by up to 50 percent. Also, PM10 emissions were based on emissions factors for total suspended particulates which result in conservatively high pollutant emissions because total suspended particulates include those particles greater than 10 μg in diameter. PM10 emissions include only those particulates with a diameter less than 10 μg.

APPENDIX F

NOISE

F-1 NOISE ANALYSIS

F-2 NOISE COMPLAINT QUESTIONNAIRES

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APPENDIX F-1

NOISE

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APPENDIX F-1
NOISE TECHNICAL APPENDIX

Noise Contours

As described in Section 3.3.3, the sources of noise associated with the operation of MMR and that have the potential for affecting people outside of the MMR boundaries are small arms fire (less than 25 mm; M60 machine guns, M16 rifles, etc.), heavy weapons (artillery, mortar, demolition charges, explosives testing) usage, and aircraft operations. The extent of public annoyance due to these sources of noise is related to a number of factors including the frequency content of the noise, its amplitude, and whether it occurs during the daytime or nighttime. Because of the different properties of these noises, different noise metrics have been developed. The following paragraphs summarize the procedures used by the Army and Air Force to develop noise contours based upon equivalent degrees of annoyance. In turn, the regions defined by the contours have been interpreted in terms of land use planning guidelines. Table F-1 summarizes the correspondence between land use zones, extent of public annoyance, and noise metrics.

Table F-1
Land Use Planning Guidelines

Noise Zone	Compatibility for Noise Sensitive Land Uses	Percent of Population Highly Annoyed	Noise Source		
			Aircraft and Other Non-impulse Noise, ADNL	Large-amplitude Impulse Noise, CDNL	Small Arms Impulse Noise, dBP
I	Compatible	<15	<65	<62	<87
II	Normally Incompatible	15 - 39	65 - 75	62 - 70	87 - 104
III	Clearly Incompatible	>39	>75	>70	>104

Small Arms

Considerable research has been conducted to determine the best correlation between noise from small arms ranges and the extent of the population annoyed. At the present time, the linear peak sound level (dBP) is considered to be the best metric for this purpose (U.S. Army, 1996a). The relationship between dBP and the percent of the population highly annoyed by small arms fire was presented in Table F-1, along with the corresponding land use compatibility zones. The model used by the Army to compute noise contours essentially determines the distance from the weapons at which 15 and 39 percent of the population would be highly annoyed. The model's primary inputs are range location, type of weapons, and direction of fire. Noise contours associated with existing small arms use and projected use associated with the five Range Projects were prepared by the U.S. Army Center for Health Promotion and Preventative Medicine (U.S. Army, 1996a and 1996b).

Large Caliber Weapons

The C-weighted day-night level (CDNL) has been determined to be the most appropriate noise metric for describing the noise produced by high amplitude noise resulting from armor, artillery and demolition activities. The C-weighting emphasizes the low frequency components of noise from these sources. These are the same components that can cause building vibration and visible and audible motion such as the rattle of windows and/or the motion of dishes or other objects on shelves. CDNL has been shown to have a good correlation with the perception and associated annoyance from such noise.

To compute noise contours associated with the large caliber weapons class of noise sources, the U.S. Army uses the MicroBNOISE program (U.S. Army, 1996a). Inputs to this program include operational data concerning type of weapons fired from each range or firing point including demolition's, the time of day, number, and type of rounds fired from each weapon, the location of targets for each range or firing point and the amount of propellant used to reach the target. A listing of weapons utilization data is presented in Table 3-6.

Air Force

The U.S. Air Force uses the A-weighted day-night noise level (ADNL) metric as the standard noise metric for aircraft flight and ground operations. ADNL shows a good correlation between aircraft noise and the extent of population highly annoyed. Population annoyance data were presented in Table F-1, along with the corresponding land use compatibility zones. As noted in Table F-1, the Zone III region (where ADNL exceeds 75 dBA) is considered incompatible with residential land uses and the Zone I region (where ADNL is less than 65 dBA) is considered compatible for residential use. The region between these areas (Zone II) is considered "normally incompatible" in that a number of governmental agencies have imposed construction and/or mortgage lending restrictions on the development of residences; the Air Force policy is that whenever possible, residential land use should be located in those areas where ADNL is less than 65 dBA (i.e. in Zone I). The compatibility levels for ADNL were developed through social surveys conducted by many government and private organizations.

Noise contours based upon the ADNL were developed by the Air Force using the NOISEMAP noise prediction program (MAANG, 1996). The steps included obtaining aircraft operational and maintenance data to derive average busy day operations by time of day, by runway, and type of aircraft. A summary of current aircraft utilization data is presented in Table 3-11. Additional information employed consisted of flight track information, flight profile information, and ground runup information. The data used in the model to predict noise contours included the effects aircraft operations for all organizations using MMR.

APPENDIX F-2

NOISE COMPLAINT QUESTIONAIRE

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NOISE COMPLAINT QUESTIONAIRE

INCIDENT CONTROL NO. __________

INSTRUCTIONS: This questionaire is to be used whenever a person contacts our office concerning noise problems. The form contains a series of steps, each involving questions to be asked of the inquirer, along with directions to be followed for various types of answers. (Always thank the complainant for calling when you end the interview).

STEP 1.

QUESTION: Are you calling to obtain information or to make a formal complaint? (Circle Answer).

[✓ a. Information] b. Complaint

IF a, PROVIDE INFORMATION, TERMINATE INTERVIEW, & FILE THIS FORM
IF b, GO TO STEP 2.

STEP 2. READ THE FOLLOWING STATEMENT TO THE INQUIRER:

"IN ORDER TO HELP US AVOID FUTURE NOISE DISTURBANCES, WE HAVE DEVELOPED A SERIES OF QUESTIONS DESIGNED TO PINPOINT THE EXACT CAUSE OF YOUR COMPLAINT. ARE YOU WILLING TO ANSWER SOME QUESTIONS ABOUT YOUR COMPLAINT?"

a. Yes b. No

IF Yes, GO TO STEP 3.
IF No, TERMINATE INTERVIEW AND FILE THIS FORM.

STEP 3. GATHERING BASIC DATA.

QUESTION: What is your name, address, and telephone number?

____
NAME

____
ADDRESS

____
TELEPHONE NUMBER

QUESTION: Where are you located in relation to the post?

NORTH	NORTHEAST	EAST	SOUTHEAST
SOUTH	SOUTHWEST	WEST	NORTHWEST

QUESTION: When did the annoying noise occur?

DATE ________________ TIME______________

QUESTION: What was making the noise? (Circle Answer).

AIRCRAFT/HELICOPTER EXPLOSION OTHER ___________________

IF AIRCRAFT, REFER INQUIRER TO PAO OTIS AIR BASE # 968-4090 & FILE FORM
IF HELICOPTER, REFER INQUIRER TO STATE AVIATION OFFICER # 968-5822 AND FILE THIS FORM.
IF EXPLOSION, GO TO STEP 4.

STEP 4. FOR BLASTS AND EXPLOSIONS.

QUESTION: Where were you when the noise disturbed you?

Indoors Outdoors

QUESTION: How did the noise disturb you? (Circle ALL that apply)

Shook the house Woke you Startled you Rattled windows

Disturbed livestock Woke a child Frightened the pet

Cracked the plaster Broke a window Other ______________

QUESTION: How many blasts or explosions were disturbing? (Circle Answer)

1 - 2 3 - 7 7 - 15 More than 16

QUESTION: How closely spaced were the explosions? (Circle Answer)

Close like a machine gun Several all at once

5 - 10 minutes apart More than 10 minutes apart

QUESTION: How long did the disturbance last? (Circle Answer)

Less than 5 minutes 5 to 30 minutes 30 minutes to 1 hour

1 to 2 hours 2 - 4 hours 4 - 8 hours All Day All Night

QUESTION: Any other information about the incident?

____

____

____

____

NOW TERMINATE THE INTERVIEW, THANK THE CALLER, AND GO TO STEP 5.

STEP 5. WEATHER CONDITIONS DURING NOISE COMPLAINT TIME FRAME.

CIRCLE THE DESCRIPTION WHICH BEST DESCRIBES THE WEATHER WHEN THE ANNOYANCE OCCURED:

Overcast, poor visibility   Cold and Clear   Warm and hazy

Cold, hazy or foggy morning   Other ________________________

Complete the following as is on the Weather Data Worksheet

DAY/DATE	TIME		TEMPERATURE	HUMIDITY	STICK WGT (GRAMS)
______________	_____	HI			
CLASS	VALUE				
______________	_____	LO			
		NOW			

STATE OF THE WEATHER	DIRECTION	WIND SPEED	PRECIPITATION 24 HOUR RAINFALL
__________________	__________	__________	_________ HOURS

TIME STARTED (RAIN/SNOW) __________ TIME STOPPED ________   _________ INCHES

LIST THE HOT RANGES AT THE TIME OF DISTURBANCE(S):

RANGE	UNIT	WEAPON(S)	MUNITION	HOT/COLD TIMES	REMARKS

ENTER TIME & DATE OF COMPLAINT: ____________________________________

NAME OF INDIVIDUAL RECORDING COMPLAINT _____________________________
(PLEASE PRINT)

CONTROL NO: ____________

102nd FIGHTER WING
PUBLIC COMPLAINT/AIRCRAFT NOISE COMPLAINT REPORT

1. COMPLAINT INFORMATION DATE & TIME RECEIVED: ____________

a. Complainant's name: ____________
Address: ____________
Telephone: ____________

b. DATE OF INCIDENT: ____________ TIME OF INCIDENT: ____________

c. Type of incident: ___ Noise ___ Sonic Boom ___Alleged violation (include low flying)
___ Other (Explain) ____________
Location of incident: ____________

____

d. Type and number of aircraft: ____________

e. Color, aircraft appearance/configuration, tail number: ____________

____

f. Weather condition: ____________

g. Direction of flight: ____________

h. Damage claim: ____________

i. Summary of complaint: ____________

____

____

____

____

____

____

j. Action requested by complainant: ____________

k. Person receiving complaint:
Name: ____________ Rank: ______ Unit: ____________ Phone: ________

2. INVESTIGATION AND ANALYSIS:

a. Responsible office: ____________

b. Aircraft involved: Unit: ____________ Type: ________ Number ________
Departed from: ____________ Take off time: ____________
Landed at: ____________ Landing time: ____________
Runways used: Take off: ____________ Landing: ____________
Winds: ________ Cloud cover: ________ Weather: ________
Other factors: ____________

____

____

3. COMPLAINT RESPONSE: DATE & TIME OF RESPONSE: ____________

a. Complainant contacted with results:
YES ___ NO ___ Letter ___ Phone ___
EXPLANATION TO COMPLAINANT: ____________

____

____

____

____

____

____

b. Complainant satisfied by response: YES ___ NO ___

c. Complainant claim against government: YES ___ NO ___

d. Complainant's comments: ____________

____

____

____

____

____

APPENDIX G

BOMARC SURVEY

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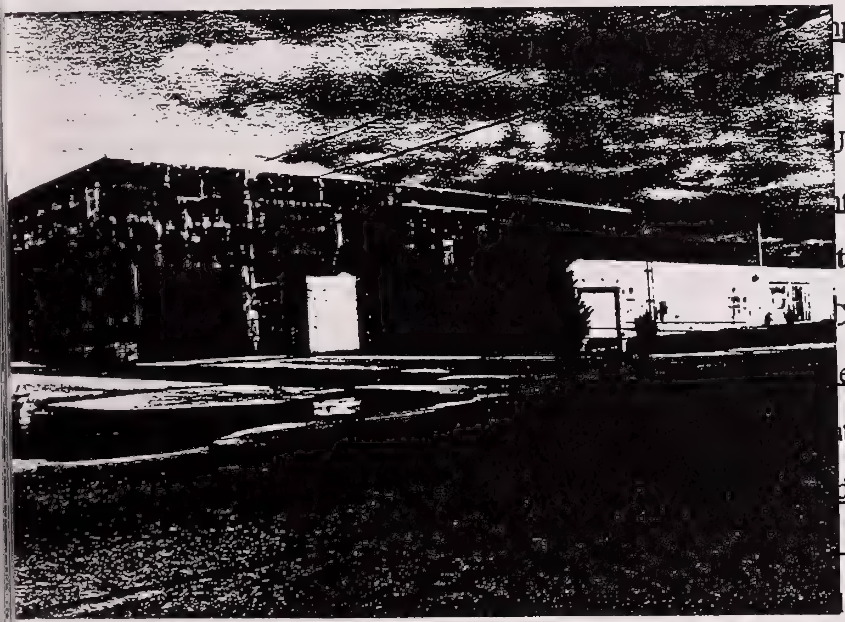
FORM A - AREA

Assessor's Sheets	USGS Quad	Area Letter	Form Numbers in Area
not applicable (Military reservation)	Pocasset MA		

Massachusetts Historical Commission
Massachusetts Archives Facility
220 Morrissey Boulevard
Boston, Massachusetts 02125

Town Sandwich

Place ***(neighborhood or village)*** Otis Air National Guard



mp Edwards

f Area BOMARC missile facility

Use U.S. Army National Guard Unit Training

t Site (UTES)--maintenance and storage

tion Dates or Period 1959-1962

Condition the majority of the structures are in

ed condition; three are in good condition

trusions and Alterations Boeing Operations

d Warehouse, fuel storage tank demolished

approximately 70 acres

by Matt Kierstead and Nancy Tinker

Organization The Public Archaeology Laboratory, Inc.

Date ***(month/day/year)*** March 1996

ketch Map

ee Continuation Sheet

AREA FORM

ARCHITECTURAL DESCRIPTION X *see continuation sheet*

The Otis Air Force Base BOMARC (Boeing Michigan Aeronautical Research Center) guided surface-to-air missile facility is an approximately 70-acre complex located within the Otis Air National Guard Base/Camp Edwards complex. The BOMARC facility is located on the west side of Greenway Road within a rectangular wooded area bounded by Greenway, Dolan, Forestdale, and Turpentine roads approximately 1 mile north of the center of the Air Force Base runway complex. The facility is surrounded by an open grassland buffer, and the surrounding landscape is typical of Cape Cod with scrub pine and oak trees growing on flat sandy soil. The BOMARC facility was constructed to U.S. Air Force standard plans and consists of two adjacent chain-link-fenced complexes connected by a paved driveway, Road A, that extends west from Greenway Road, bisects the entire complex, and diverges to serve the individual buildings and structures. The east complex includes the power plant, assembly, maintenance, fueling, testing, storage, security, and other support facilities for the missiles. These single- to multi-level structures vary widely in size and are typically of cinder block or concrete construction with flat, steel-truss roofs, corrugated metal siding, and multi-pane, metal-sash windows. The west enclosure contains 56 missile launcher shelters divided into two long 28-unit sections or "flights" consisting of two rows of 14 shelters each. The launcher shelters are 1-story garage-like reinforced concrete structures with heavy steel doors and sliding roofs and are linked by buried concrete "utilidor" utility tunnels with moveable lids. The original east fence line has been reconfigured to exclude three structures from the complex that currently serve as a Massachusetts Army National Guard UTES (Unit Training Equipment Site) for the maintenance and storage of National Guard equipment and vehicles. All structures within the fenced areas are currently vacant and in deteriorated condition.

HISTORICAL NARRATIVE X *see continuation sheet*

In the years following World War II, the United States military entered a time of peace and new direction. The war in Europe had been won decisively by Allied forces, but that victory brought new fears. The American military, fearing a bombing attack by the Soviet Union, sought a defensive system capable of intercepting incoming enemy aircraft. The resulting Boeing Michigan Aeronautical Research Center (BOMARC) system, along with the Nike missile system, became one of two defining anti-aircraft weapon systems developed by the United States during the Cold War (JCA 1996:19).

Between 1945 and 1989 tensions between the Soviet Union and the United States steadily increased. The document "To Defend and Deter: the Legacy of the United States Cold War Missile Program" (Lonnquest and Winkler n.d.) describes these tensions:

> Competition between the two superpowers was played out at many levels, but none was more visible, more consistent, or had greater impact on the United Sates than the arms race. [F]ar removed from the public debate, the arms race was a battle for technological supremacy, one that was waged in laboratories and factories across the country and encompassed the entire spectrum of military technology from conventional arms to nuclear weaponry. As the arms race unfolded a new class of weapons, guided missiles armed with nuclear warheads, emerged as the defining weapons technology of the Cold War. [The] strategic balance of power changed quickly in 1949 when the Soviet Union acquired nuclear weapons. Suddenly the United States found itself vulnerable to Soviet air attack.

BIBLIOGRAPHY and/or REFERENCES x *see continuttion sheet*

CEHP Incorporated/National Conference of State Historic Preservation Officers
1991 *Coming In From The Cold: A Preliminary Report on the Legacy Cold War Study*
U.S. Department of Defense, Washington, D.C.

___ **Recommended for listing on the National Register of Historic Places. If checked, you must attach a completed National Register Criteria Statement.**

ARCHITECTURAL DESCRIPTION *(continued)*

All of the Otis Air Force Base BOMARC missile complex buildings and structures were erected between 1959 and 1962 and were decommissioned in 1972. The U.S. Army Corps of Engineers, New England Division, oversaw construction of the BOMARC facility with additional architects responsible for specific buildings and structures and adaptation of standard Air Force plans to the site. All buildings and structures are now vacant and in deteriorated condition except for MS-8, the Security Control and Fire Station building, MS-11/MS-12, the Vehicle Storage Building/Composite Building, and MS-13, the Assembly and Maintenance Building, which are in good condition and maintained by the Massachusetts National Guard as a UTES (Unit Training Equipment Site) facility. All structures are original and contribute historically to the area. They are of astylar utilitarian design. The MS and LS identification numbers are from the original as-built record drawings, and the 4-digit numbers are Otis AFB building identification numbers. The letter-designated roads are indicated on the sketch map. Two Boeing design and construction buildings were originally located at the east edge of the support complex. The Boeing Office, located south of Road A, was removed after completion of the BOMARC facility, and the Boeing Warehouse, located north of Road A, was removed as part of the UTES conversion. The appearance and construction of these buildings is unknown.

1. MS-1 (4602) Assembly and Maintenance Shop. The Assembly and Maintenance Shop, located at the center of the support complex between Roads A and B, consists of a large high central block with shorter north and south flanking bays. All three sections have flat roofs and rest on a concrete slab foundation. The central block, or Main Shop Area, is a 38-foot-high building with steel-framed corrugated metal-clad walls and a built-up roof supported by steel trusses. The steel wall framing carries an overhead traveling crane over the 180 by 80 foot clear-span concrete shop floor. Doorways on the long north and south interior walls lead into rooms in the two side bays. The elevations of the central block are entirely featureless with the exception of the 24-foot-wide, 20-foot-high motorized, steel, missile entry roll door located at the far west end of the south elevation. The attached south bay is a 178 by 62 foot, 16-foot-high cinder block building offset 30 feet to the east to accommodate the missile entry door. Entrances are mostly confined to the south elevation and consist from west to east, of a sunken truck ramp with two overhead doors, three steel personnel doors, another two truck doors at ground level, and another personnel door. There are no windows on this bay, and a 26-foot-square windowless second-story penthouse is located toward the west end. The north bay is a 208 by 32 foot, 12-foot-high cinder block building with a 26-foot-square windowless second-story penthouse located toward the east end. The long north elevation contains several ladders, louvers, doorways, and paired and single 4-light steel-sash windows. The east elevation includes paneled steel double doors. The Assembly and Maintenance Shop housed facilities for assembling, testing, and servicing the BOMARC missiles. Complete units were serviced on cradles on the Main Shop floor, and rooms in the side bays contained equipment for testing batteries, ramjet engines, radar guidance, and other systems.

2. MS-2 (4606) Heat and Power Building. The Heat and Power Building, located due west of the Assembly and Maintenance Shop, is a 144 by 108 foot structure built on an L-shaped plan with a long 144 by 62 foot, 30-foot-high north section and a 64 by 46 foot, 40-foot-high section attached to the west end of the south elevation. The entire structure has an 8-foot-high cinder block ground story, insulated corrugated metal sheathing and flat roofs. The most prominent exterior feature is the 60-foot-long, 12-foot-high cinder block exhaust muffler bank located at ground level at the center of the north elevation. The primary personnel entrance is in the south elevation of the taller section and consists of a single hollow-core metal door flanked by four 4-light windows at each side. A 14-foot-high roll-type door is located at the south end of the east elevations of both sections. A bank of eight contiguous 10-light steel-sash windows is located in the south and west elevations of the lower section. The west elevation also contains a roll-type door, a personnel door, and a row of three- two- and one-unit 4-light windows. The roof line is broken by several short stacks and

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ventilators. A steel-frame, wood-lattice cooling tower is located north of the building. The Heat and Power Building was vital to the BOMARC complex, which was designed to be self-sufficient for all power, utility, and physical plant needs. This building housed the equipment for generating heat, electricity, and chilled water for the complex, including boilers, compressors, pumps, diesel generators, and oil burners. This building also housed nitrogen-generating equipment and compressors for the missile fueling and cleaning facilities. The extent of surviving original equipment is unknown.

3. MS-3 (4605) Change House. The Change House, located between Roads A and D, across from the Propellant Acid and Propellant Fuel facilities, is a 3 by 5 bay, 50 by 22 foot, 1-story rectangular flat-roofed cinder block building. Cracking of the masonry at the center of the east and west elevations reveals that the building was doubled in length after its original construction. The narrow north and south elevations each contain a central hollow-core steel personnel door flanked by paired 2-light steel-sash horizontal hopper windows. The north elevation includes a 6-light steel-sash awning window. The long east elevation includes both window configurations, with the high horizontal 2-light windows at the south end. All windows have slightly protruding concrete sills. The west elevation contains five horizontal windows high on the walls. This window arrangement indicates the location of the locker rooms, showers, and latrine. The Change House was used as a changing, washing, and decontamination facility for BOMARC personnel involved in acid, fuel, or nuclear materials handling.

4. MS-4 (4603) Propellant Fuel Facility. The Propellant Fuel Facility is a 78 by 52 foot, 1-story steel-frame building located at the east end of Road D. The building has a high cinder block foundation and is sheathed with insulated corrugated metal siding above. The building is divided longitudinally into high and low sections. The high section contains a metal roll-type garage door in the east and west elevations and is lit by short banks of 6-light steel-sash windows at each end of the long north and south elevations. The low section is featureless, with the exception of hooded ventilators on the south elevation. Both sections have slightly pitched shed roofs to facilitate drainage. A rack of six cylindrical fuel storage tanks, now removed, stood immediately west of the building. A concrete vehicle drain pad with a steel pipe fuel transfer stand is located immediately west of the tank area. A statement of function appears at the end of the following description.

5. MS-5 (4607) Propellant Acid Facility. The Propellant Acid Facility is a 78 by 28 foot, 1-story steel-frame building located at the west end of Road D. The building has a high cinder block foundation and is sheathed with insulated corrugated metal siding above. The building has a metal roll-type garage door in the east and west elevations and is lit by short banks of 6-light steel-sash windows at each end of the long north and south elevations. The building has a lower 28-foot-square section extending from the center of the west elevation. This section has a central entrance with a hollow core metal door flanked by 6-light metal-sash windows. Similar windows appear on the east and west elevations. Both sections have slightly pitched shed roofs to facilitate drainage. A rack of two cylindrical acid storage tanks, now removed, stood immediately west of the building. A concrete vehicle drain pad with a steel pipe acid transfer stand is located immediately west of the tank area.

Propellant Acid and Propellant Fuel facilities function: These facilities were elements of a "shelter fueling" system incorporated in the BOMARC missile system. The reactive properties of the fuels and acid oxidizers required duplicate facilities located over 120 feet apart to prevent their coming into contact. The missiles were kept ready and loaded with fuel that had to be periodically removed, tested, and refilled after the missile fuel tanks were decontaminated. Special mobile fueling vehicles serviced the missiles on their launchers and returned to their propellant facilities, where the propellants were pumped out at the transfer stands using inert pressurized nitrogen. The smaller sections of the propellant facility buildings contained equipment for pumping, mixing, and testing propellants that were stored on rack-mounted tanks outside the buildings. The large open space inside the larger sections with the roll doors at each end were used for straight-through servicing and decontamination of fueling vehicles and missiles.

6. Acid Neutralizing Well and Spill Pit (MS-7 [4645]), Pump Houses, and Fume Washer. This group of structures is located on Road C at the south side of the support complex between the Propellant Acid and Propellant Fuel facilities. MS-7, the Acid Neutralizing Well and Spill Pit, was associated with the fueling and de-fueling of the missiles. The Pump Houses are a cluster of three small 1-story rectangular flat-roofed cinder block buildings with hollow core steel personnel doors with steel-sash windows facing the roadway. Associated appurtenances, including pipes, valve control stands, and manhole covers, are located on or around the buildings. These pump houses were used to regulate the flow of clean water and fuel oil into the missile complex. The Fume Washer is a tall, square, sheet-metal tower with a blower housing and high-temperature piping at the base. This unit was used to scrub acid and fuel vapors generated during periodic missile fueling and de-fueling activities at the adjacent Propellant Acid and Propellant Fuel facilities.

7. MS-8 (4600) Security Control and Fire Station. The Security Control and Fire Station is located approximately 350 feet west of Greenway Road on the south side of Road A at the entrance to the support facility. The Security Control and Fire Station is an 80 by 35 foot rectangular 1-story flat-roofed cinder block building with a 12-foot-square guard station extending from the northeast corner. The guard station roof is cantilevered out from the walls to provide shade and shelter for personnel. A chain-link fence cage encloses the sheltered area and includes a tall rotating steel-pipe turnstile. The north elevation of the guard station contains a full-width multi-pane steel-sash window with a protruding concrete sill. The remaining north elevation of the building is essentially featureless. The east elevation of the guard station contains a central hollow core metal door with a 4-light window flanked by a 6-light steel sash awning window with protruding concrete sills. Similar 6- and 4-light windows are located in the remaining east elevation. The western third of the building is raised to accommodate fire-fighting equipment, and two tall metal roll doors are located in the west elevation. The south elevation of the fire equipment garage contains four square 6-light metal-sash windows on protruding concrete sills. The remaining south elevation includes narrower versions of these windows, personnel doors and a small roll-type garage door in the extreme east end. This building was originally the sole entry and security checkpoint for personnel and vehicles entering or leaving the BOMARC missile complex and also housed the complex's dedicated fire-fighting vehicles and equipment. This building is currently used for the temporary storage of hazardous waste generated by Massachusetts Army National Guard vehicle maintenance activities at the adjacent Vehicle Storage/Composite Building.

8. MS-11/MS-12 (4601) Vehicle Storage Building/Composite Building. The Vehicle Storage Building/Composite Building are two attached 1-story rectangular cinder block structures located at the south side of the support facility west of the Security Control and Fire Station. The Vehicle Storage Building is a 120 by 50 foot flat-roofed structure offset to the north end of the east elevation of the Composite Building. Metal roll-type garage doors are grouped in threes on the north end of the east and west elevations with an additional door on the south end of the east elevation. Three metal-sash windows with protruding concrete sills are located on the north elevation, and similar windows flank a single roll door located the south elevation. This building was formerly a vehicle maintenance shop for the BOMARC missile facility, and it continues in that role for the Massachusetts Army National Guard. The Composite Building is a 160 by 120 foot cinder block building with an exposed steel frame and an undulating shallow modified gable roof. The principal personnel entrance is in the west elevation and consists of double aluminum doors with a row of four large single-pane windows immediately to the south. Other features include a roof access ladder, ventilation louvers, and a roll-type garage door to the south of the entrance. The east elevation contains a ladder and two single personnel doors. Both the north and south elevations contain a single personnel door and two roll-type garage doors at the east end and double personnel doors at the west. The Composite building contains Massachusetts Army

National Guard offices, training equipment storage and supply rooms, and radio testing facilities. The Composite Building was constructed as part of the support system for the 28 Type B BOMARC Flight 2 missile launcher shelters and was used for radar guidance system testing and parts and equipment storage. The building serves essentially the same function today for the Massachusetts Army National Guard.

9. MS-13 (4641) Assembly and Maintenance Building. The Assembly and Maintenance Building, located at the northern edge of the support complex, is a 85 by 70 foot cinder block structure with a built-up roof with a slightly raised ridge line to facilitate drainage. A sheet-metal ventilator crowns the ridge line. The south elevation contains the primary entrances, which consist of two 20-foot-wide by 16-foot-high, 3-leaf, sliding doors each with a personnel door and a 2-leaf hinged "radar window" door in the center. An additional personnel double-door is located to the east of these entrances and leads to a tool crib. The east and west elevations are essentially featureless, and the north elevation contains two personnel doors and two 8-foot-square "blow-out panels" directly opposite the hinged, 2-leaf radar window doors on the south elevation. The interior is divided into two bays by a central row of steel girder columns that support a steel framework with a 6-ton monorail hoist riding on a girder above each bay. Heavy concrete missile station foundations are cast into the floor. The Assembly and Maintenance Building was constructed as part of the installation of the 28 Type B BOMARC Flight 2 missile launcher shelters and was used for radar guidance system testing and other assembly and maintenance tasks.

10. 1-1 to 1-28 Flight One--Type A Missile, Type II Launcher Shelters. The earlier (1960) Type II missile launcher shelters are located west of the support complex and are split into two groups of fourteen launchers each on the north and south sides of Road A. These launcher shelters are rectangular 15-foot-high reinforced concrete and steel structures with 60 by 22 foot concrete launcher room foundations. The long north and south elevations consist of precast reinforced concrete panels slipped into vertical steel I-beams. The shorter east and west elevations contain a pair of folding 2-leaf steel doors. The launcher room interiors contain a launcher erector pit, now filled in, and are otherwise empty with the exception of light fixtures. These structures were designed to withstand the forces of a missile launch. Attached to the south elevation of the east row Type II launchers and the north elevation of the west row of Type II launchers, is a 25 by 10 foot integral shed-roofed cinder block equipment room. The equipment rooms contained the electrical, hydraulic, and gas pneumatic equipment necessary to launch the missile. The side opposite the equipment rooms has overhanging roof members supported by a gallery of four steel I-beams. The launcher shelter roofs consist of two heavy horizontal steel leafs that were designed to be weather-tight and to slide apart longitudinally in five seconds to allow the raising of the missile into firing position. The exterior roof tracks and mechanisms are protected by a grid of narrow black corrugated metal housings. The electrical, hydraulic, and pneumatic control lines for all of the launcher shelters are connected to the Heat and Power Building by a buried concrete "utilidor" utility tunnel with removable concrete lids.

11. 2-1 to 2-28 Flight Two--Type B Missile, Type IV Launcher Shelters The later (1962) Type IV missile launcher shelters are located west of the Type II shelters in a similar layout. The Type IV shelters are similar to the Type II shelters in function and operation. These launcher shelters are rectangular 15-foot-high reinforced concrete and steel structures with 60 by 22 foot concrete foundations. The long north and south elevations consist of precast reinforced concrete panels held by vertical steel I-beams. The shorter east and west elevations contain a pair of folding 2-leaf steel doors. The launcher room interiors contain a launcher erector pit, now filled in, and are otherwise empty with the exception of light fixtures. These structures were designed to withstand the forces of a missile launch. An equipment room is incorporated into each launcher room. The equipment rooms contained the electrical, hydraulic, and pneumatic equipment necessary to launch the missiles. The long north and south exterior elevations have overhanging roofs supported by a gallery of four steel I-beams. The launcher shelter roofs consist of two heavy horizontal steel leafs designed to be

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weather-tight and to slide apart longitudinally in five seconds to allow the missile to be raised into firing position. The exterior roof tracks and mechanisms are protected by grid of narrow silver corrugated metal housings. The control lines for the shelters are connected to the Heat and Power Building by the utilidor.

12. LS-2 (4618) Compressor Building. The Compressor Building, located immediately north of Road A at the entrance to the missile launcher shelter complex, is a 79 by 25 foot 1-story rectangular steel-frame building with corrugated metal siding constructed on a high cinder block foundation. The flat roof has a metal coping at the roof line, and several metal ventilators are clustered near the center of the roof. The east elevation contains a large hinged metal overhead track door flanked by two hollow core metal personnel doors with 4-light steel-sash windows. The north elevation contains two similar doors and a 4-light window. A fenced high-voltage electrical substation with switching gear and transformers mounted on a concrete slab is located immediately south of the building. A low, open-sided corrugated metal shed is located immediately to the north, as are two pairs of massive cast reinforced concrete cradles for two batteries of cylindrical steel compressed air tanks, now mostly removed. This building contained compressors, driers, and controls (now largely removed) for the low- and high-pressure compressed air and compressed helium systems for the missile launchers.

13. LS-3 (4633) Ordnance Storage Building. The Ordnance Storage Building, located immediately north of Road A in the center of the missile launcher shelter complex, consists of two connected 40 by 18 foot 1-story rectangular flat-roofed buildings arranged on an L-shaped plan. The Maintenance Room (southern) section is constructed of cinder blocks, with a metal coping at the roof line on its narrow east and west elevations. There is a doorway in the west elevation and a circular tin ventilator on the roof. The perpendicular Warhead Storage (northern) section is constructed of reinforced concrete with three warhead storage bays with heavy steel doors on the east and west elevations. The Ordnance Storage Building was used to store BOMARC missile nuclear warheads.

14. LS-4 (4610) Traffic Check House. The Traffic Check House is a 12 by 8 foot, 1-story rectangular cinder block building with an overhanging flat built-up roof with a metal coping. This building is a sentry station that monitored the sole entrance to the missile launcher shelter complex from the support complex on Road A. The roadway (north) elevation contains a centered hollow core metal door with a 4-light metal sash window. The entrance is flanked by 4-light awning windows with two fixed lights below. The building rests on a concrete slab that, like the window sills, protrudes slightly from the walls. The gate is located immediately north of the Traffic Check House and consists of four tall steel pipe uprights supporting a shrouded horizontal track for a tall chain link gate that is no longer in place.

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HISTORICAL SIGNIFICANCE *(continued)*

> To counteract the Soviets' new offensive capability the United States hurriedly bolstered its air defense system by deploying additional anti-aircraft artillery batteries and also accelerated the development of the Nike and BOMARC surface-to-air missiles (quoted in JCA 1996:20).

Operational in 1953, the Army's Nike Ajax system became the nation's first surface-to-air guided missile (Parkman 1978:150). The missile, more rocket than aircraft, was fired by a booster, bore a conventional warhead, and reached a range of 30 miles. Later Nike models had an improved range of 75 miles and altitude capabilities of 150,000 feet (JCA 1996:20).

The Air Force's BOMARC system became operational in 1959. Designed as a pilotless aircraft, the missile measured 45 feet long, possessed nuclear capabilities, and could range a distance of 440 miles. The BOMARCs received data while in flight from ground-based radar stations located along the east coast of the United States. This weaponry was capable of destroying large numbers of incoming enemy aircraft with a single missile (JCA 1996:20-21).

Development of the BOMARC concept began in 1943, when the Department of Defense realized the United States could be subjected to a Soviet sponsored long-range bombing attack. The American military believed the Soviet attack, if it came, would travel northwest towards the Arctic Circle and from that point south, rendering the American eastern seaboard vulnerable to Soviet bombers. American military strategists sought a weapon capable of supplementing existing long-range aircraft and "point-defense" systems (Lonnquest and Winkler n.d.). The development of weaponry capable of identifying, tracking, intercepting, and destroying enemy aircraft before that aircraft reached American shores was identified by the American military as a critical need (JAC 1996:21) The Boeing Corporation, under contract to the United States Air Force, began development of a Ground-to-Air Pilotless Aircraft (GAPA) in 1946 (JCA 1996:21).

Boeing conducted testing in Wendover, Utah. The prototype was small, measuring only 16 feet in length, but the missile reached a height of 80,000 feet, pushing the concept of pilotless interceptor from theory into possibility. Boeing then combined their efforts with The University of Michigan's Aeronautical Research Center, an entity researching control and command systems for long-range missiles. They designed a missile and christined it "BOMARC": BO for Boeing and MARC for Michigan Aeronautical Research Center (JCA 1996:21).

Designers intrended the BOMARC system to be guided by a ground-based early warning system, the Semi-Automatic Ground Environment, or SAGE. This computerized tracking system was planned to identify incoming enemy aircraft, program and launch intercepting missiles from a remote location, and then guide these missiles to their targets. Development of the SAGE system was directed by the Air Force through the Massachusetts Institute of Technology's Lincoln Laboratory (JCA 1996:3, 22).

During the launching sequence, estimated to occur within two minutes, the launching facilities' roofline would open and the missile would be raised to a vertical position by its launch armature. Launched by liquid fuel, and later by solid fuel boosters, the missile would eject these boosters upon reaching the prescribed altitude. At that point the BOMARC would be powered by its own ram jet engines. Guided by the SAGE system, the missile's internal guidance system would assume control once the missile was within 10 miles of its intended target. Engineers intended the missile to not focus on a single target, but rather to detonate within a cluster of incoming aircraft, thus destroying not one but many planes (JCA 1996:22).

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The development of the BOMARC missile occurred in two phases. In the original (Type A) concept, the missile was powered with liquid fuel boosters. The missile's secondary design phase (Type B) replaced liquid fuel boosters with solid fuel and equipped the missile with a Westinghouse DPN-53 radar system. The employment of this radar system marked the first use in history of a "production pulse-doppler system" giving the missile the ability to seek low-altitude targets. The replacement of liquid with solid fuel allowed more secure maintenance and a more compact design. As engineers refined missile technology, moving from Type A into Type B design, differences in missile length, weight, range, and cruising altitude also occurred (Lonnquest and Winkler n.d.). Design modifications are noted below:

Length:

Type A; 45.25 feet　　Type B; 43.75 feet

Weight:

Type A; 15,000 pounds　　Type B; 16,000

Range:

Type A; 230 miles　　Type B; 440 miles (Nearly Mach 4)

Cruising Altitude:

Type A; 60 - 70,000 feet　　Type B; could climb above 80,000 feet

As modifications to missile design were made, alterations also occurred to missile housing, or "launch shelters." Engineers planned that each missile would be individually stored within its own launching facility. During the developmental phase, engineers designed four versions of this facility. They are described below:

- Type I - Constructed of concrete and metal, the facility measured 75 feet long, 60 feet wide, and 28 feet high. The size, difficulty in construction, and construction/maintenance expense forced a re-evaluation of this design.

- Type II - Considerably smaller than its prototype, this facility measured 70 feet by 42 feet by 15 feet. The facility was designed with a concrete foundation, concrete block and metal walls, and roll back roof. This type of shelter was the most extensively used throughout the system and was installed during Type A missile deployment. Installation expense per 56-missile squadron reached approximately $13 million.

- Type III - In an attempt to reduce construction costs, engineers sought a design utilizing lighter materials. While the Type III shelter retained the same dimensions as the Type II, the new facility's lighter materials could not withstand the pressures of missile launch and were never deployed.

- Type IV - Constructed as a compromise between the successful Type II and the unsuccessful Type III, the building was constructed of concrete, concrete block, and metal. The building retained the same dimensions as the Type II and integrated the earlier roll back roof design. Type IV shelters were constructed as part of the Type B missile deployment and installed where earlier shelters did not exist.

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The Air Force had originally planned to distribute 52 BOMARC sites along both coastlines of the United States. Plans also called for establishing two installations in southeastern Canada. Each site was proposed to contain its own Air Defense Command squadron, a compliment of 120 missiles and launching shelters, and a host of support facilities.

The design and deployment of the BOMARC and Nike missile systems preceded refinement of ICBM or "air-breathing" missiles: the Navaho, Snark, Titan, Atlas, and Minuteman. Deployment of these later, intercontinental missile systems effectively diminished demand and distribution of BOMARC sites (JCA 1996:21).

In 1956, the proposed number of BOMARC missile sites was reduced from 52 to 40. By 1957 the military understood that "air-breathing" missile systems would over time supplant the BOMARC. This decision resulted in reducing the number of missiles awarded per site from 120 to 60. By the end of 1957 the total number of missile sites was cut from 40 to 31. Two existing sites received a compliment of 56 missiles, while the remaining sites were awarded 28 missiles per installation. Funding and American defense emphasis continued to shift, and reductions continued in the BOMARC program. Ultimately, eight U.S. sites and two Canadian installations were established. American sites and their periods of activation were as follows:

1959-72 McGuire AFB, NJ
1959-64 Suffolk County AFB, NY
1960-72 Otis AFB, MA
1960-64 Dow AFB, ME
1960-72 Langley AFB, VA
1961-69 Niagara Falls AFB, NY
1961-72 Kincheloe AFB, MI
1969-72 Duluth, MN

Canadian locations included North Bay, Ontario (1969-72) and La Macaza, Quebec (1969-72) (JCA 1996: 22).

Otis Air Force Base, a major Air Force Air Defense Command installation located on Cape Cod, had played a major role during World War II and had been used successively by the 14th Antisubmarine Patrol, the Civilian Air Patrol, and the Naval Air Force (Parkman 1978:134, 148-149). The base's role during the Cold War years proved no less effective. Believing the BOMARC system critical to national defense, the Air Force encouraged the system's installation at Otis Air Force Base. In 1960 and 1962 Otis received two flights each of 28 missiles and launcher shelters. The battery was self-sustaining and equipped with electrical, air conditioning, and heating facilities. Support buildings surrounded these structures. Otis was constructed by the U.S. Army Corps of Engineers, New England Division and was operated by the 26th Air Defense Missile Squadron (Lonnquest and WInkler n.d.).

Even as Boeing and the Air Force rushed to install the BOMARC missile system, the Air Force also pursued development of an intercontinental system of missiles. The installation and use of the ICBM system, with its intercontinental capacity, made the BOMARC system all but obsolete (Parkman 1978:154). The decommissioning of BOMARC missile sites began in 1964, when the battery located at Maine's Dow Air Force Base was decommissioned. The remaining seven BOMARC missile sites were also affected; all sites were decommissioned by 1972 (JCA 1996:22). The BOMARC missile system activated at Otis Air Force Base in 1960 was decommissioned in 1972. At the time of decommissioning, all missiles, warheads, missile armatures, and launch mechanisms were removed from launch shelters.

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Of the United State's eight original BOMARC batteries, the facility at New Jersey's McGuire Air Force Base is the only installation known to be intact, and the only site to remain under Air Force jurisdiction. The McGuire BOMARC site retains all of the battery's original facilities, except one remote storge building that was relocated to the main base. McGuire's BOMARC site retains all control, electrical, and launch systems. The system's launch shelters fully retain individual launching armatures. The only elements missing from the McGuire site are the BOMARC missiles and their accompanying warheads (JCA 1996).

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As-built and record drawings for the Otis Air Force Base BOMARC missile complex, U.S. Army Environmental offices, Otis Air Force Base, Sandwich, MA.

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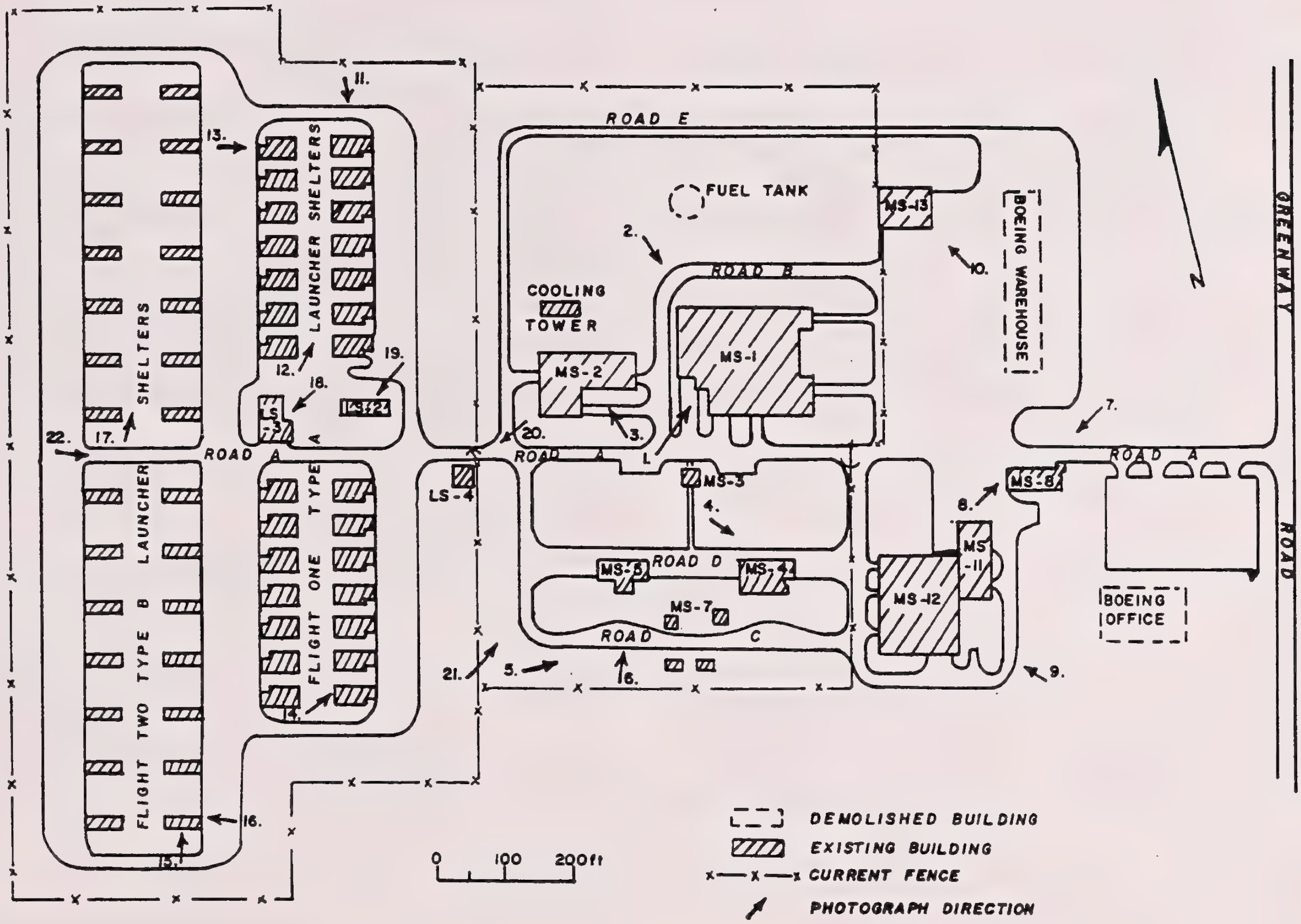
SKETCH MAP AND PHOTO KEY



INVENTORY FORM CONTINUATION SHEET	**Community:** Sandwich	**Property Address:** Otis Air National Guard Base/Camp Edwards
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DATA TABLE

OTIS AIR FORCE BASE BOMARC MISSILE FACILITY

As noted above, all structures were built 1959-1962 and have no architectural style.

MHC No.	PHOTO No.	NAME/FUNCTION	ARCHITECT/ENGINEER	COND.
	1:9A,13A	MS-1 (4602) Assembly and Maintenance Shop	J. Gordon Turnbull, Inc., Cleveland, OH	deteriorated
	1:10A	MS-2 (4606) Heat and Power Building	Anderson Nichols & Company/Samuel Glaser Associates, Boston, MA	deteriorated
		MS-3 (4605) Change House	unknown	deteriorated
	1:12A, 14A	MS-4 (4603) Propellant Fuel Facility	Anderson Nichols & Company/Samuel Glaser Associates, Boston, MA	deteriorated
	1:20A, 14A	MS-5 (4607) Propellant Acid Facility	Anderson Nichols & Company/Samuel Glaser Associates, Boston, MA	deteriorated
	1:14A	MS-7 (4645) Pump Houses, Fume Washer and Acid Neutralizing Well	unknown	deteriorated
	1:1A, 2A	MS-8 (4600) Security Control and Fire Station	unknown	good
	1:4A	MS-11/MS-12 (4601) Vehicle Storage/Composite Building	Giffels and Rosetti, Detroit, MI	good
	1:7A	MS-13 (4611) Assembly and Maintenance Building	Giffels and Rosetti, Detroit, MI	fair
	2:14A, 15A,16A, 18A	1-1 to 1-28: Flight One, Type A Launcher Shelters	Boeing Airplane Company, Pilotless Aircraft Division, Seattle, WA	deteriorated
	2:21A, 25A,26A	2-1 to 2-28: Flight Two, Type B Launcher Shelters		

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MHC No.	PHOTO No.	NAME/FUNCTION	ARCHITECT/ENGINEER	COND.
	2:10A	LS-2 (4618) Compressor Building	unknown	deteriorated
	2:9A	LS-3 (4633) Ordnance Storage Building	unknown	deteriorated
	2:3A	LS-4 (4610) Traffic Check House and gate	unknown	deteriorated
Area#	1:19A	area photo of Support Complex looking northeast	various (see above)	deteriorated
Area#	2:22A	area photo looking east down Road A from Launcher Shelter Complex to Support Complex	various (see above)	deteriorated

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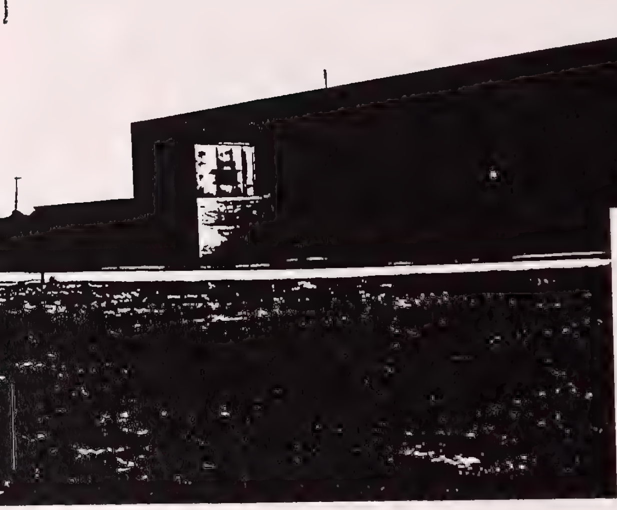
PHOTOGRAPHS *(continued)*



2. ASSEMBLY AND MAINTENANCE SHOP

3. HEAT AND POWER BUILDING

4. PROPELLANT FUEL FACILITY

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PHOTOGRAPHS *(continued)*

5. PROPELLANT ACID FACILITY
PROPELLANT FUEL FACILITY
FUME WASHER AND PUMP HOUSE

6. PROPELLANT ACID FACILITY
FUELING STAND PAD AND
TRANSFER STAND

7. SECURITY CONTROL AND
FIRE STATION

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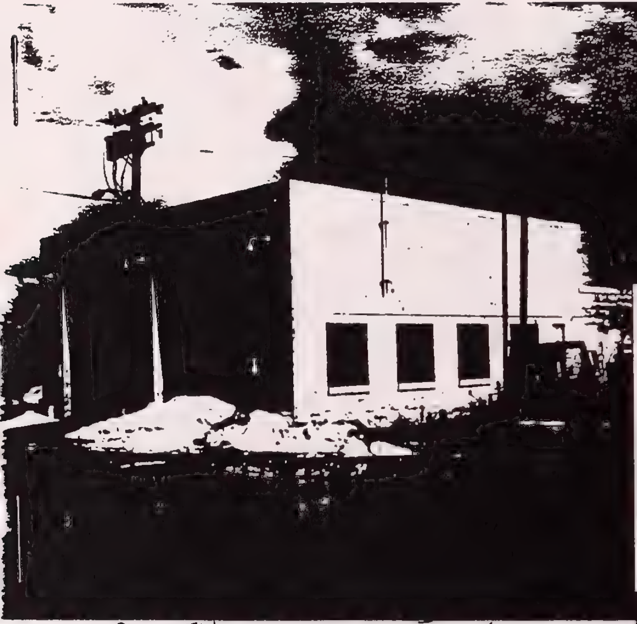
PHOTOGRAPHS ***(continued)***



8. SECURITY CONTROL AND FIRE STATION

9. VEHICLE STORAGE / COMPOSITE BUILDING

10. ASSEMBLY AND MAINTENANCE BUILDING

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PHOTOGRAPHS ***(continued)***

11. TYPE A MISSILE
LAUNCHER SHELTER

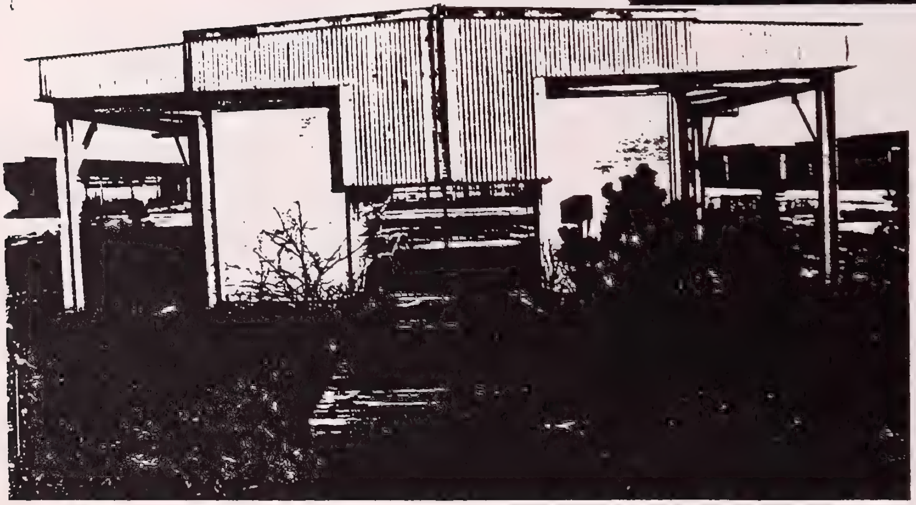
12. FLIGHT ONE, TYPE A
LAUNCHER SHELTERS

13. TYPE A LAUNCHER
SHELTER

PHOTOGRAPHS ***(continued)***

14. INTERIOR, TYPE B
MISSILE LAUNCHER SHELTER

15. TYPE B LAUNCHER
SHELTER



16. TYPE B LAUNCHER
SHELTER

PHOTOGRAPHS ***(continued)***

17. FLIGHT TWO, TYPE B
LAUNCHER SHELTERS

18. COMPRESSOR BUILDING

19. ORDNANCE STORAGE
BUILDING

INVENTORY FORM CONTINUATION SHEET

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PHOTOGRAPHS ***(continued)***

20. LAUNCHER SHELTER COMPLEX
GATE AND TRAFFIC CHECK HOUSE

21. SUPPORT COMPLEX
LOOKING NORTHEAST

22. VIEW EAST DOWN ROAD A

APPENDIX H

INSTALLATION RESTORATION PROGRAM SITE LIST

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Table H-1
Summary Of Installation Restoration Program Sites Currently Under Investigation at MMR

Study Area	Contaminant of Concern	Media	Completed IRP Phase	Current IRP Phase	Future IRP Phase
SD-2: Runway/Aircraft Maintenance Storm Drainage Ditch No. 2 FS-6: Airfield Apron Fuel Spill FS-8: Airfield Apron Fuel Spill	Aviation Gas, Diesel/#2 Fuel, JP-4, Solvents	Soil	PA, SI	RI	FS
Petroleum Fuels Storage Area FS-10: Fuel Spill FS-11: Fuel Spill	Aviation Gas, Diesel/#2 Fuel, JP-4, Solvents	Soil	PA, SI	RI	FS
SD-4: Hangar 158, Aircraft Maintenance Storm Drainage Ditch	Aviation Gas, JP-4	Soil	PA, SI	RI	FS
SD-5: Storm Drainage Disposal Site FS-5: Fuel Spill on Apron Near Aquafarm	Aviation Gas, MOGAS, Solvents	Soil	PA, SI	RI	FS
LF-1: Main Base Landfill Source OU	Solvents, Batteries, Tank Sludge, Oils, Hospital Waste	Soil	PA, SI, RI, FS, ROD, IRA (cap construction)	O&M (cap) LTM (leachate)	O&M (cap) LTM (leachate)
LF-1: Main Base Landfill Groundwater OU	Solvents, Batteries, Tank Sludge, Oils, Hospital Waste	Groundwater	PA, SI, RI	RD (Plume Containment Plan), Bourne Well Replacement	RA (Groundwater Pump and Treat System)
CS-1: North Truck Road Motor Pool	Fuel, Oils, Solvents, Antifreeze	Soil	PA	SI	NFA DD
CS-2: East Truck Road Motor Pool	Fuel, Oils, Solvents Antifreeze	Soil	PA	SI, DSRP	NFA DD
CS-3: South Truck Road Motor Pool FS-23: South Truck Road Fuel Spill	Fuels, Solvents, Waste Oil, Antifreeze, Battery Electrolyte	Soil	PA, SI	DSRP	NFA DD
CS-4: West Truck Road Motor Pool (Soil OU)	Solvents, Fuels	Soil	PA, SI, SSI, EE/CA	DSRP and Soil Removal Action (RAOPs)	NFA DD
CS-4: West Truck Road Motor Pool (Groundwater OU)	Solvents, Fuel, Oil	Groundwater	PA, SI, RI/FS, ROD	RD/RA	RAOPs/LTM

Table H-1 (Continued)
Summary Of Installation Restoration Program Sites Currently Under Investigation at MMR

Study Area	Contaminant of Concern	Media	Completed IRP Phase	Current IRP Phase	Future IRP Phase
CS-5: Former Refueler Maintenance Shop	Gasoline, Oil, Paint	Soil	PA, SI, EE/CA	SI and EE/CA	Removal Action
CS-6: Current Facility Vehicle Maintenance Shop FS-22: MAANG Motor Pool	Oil, JP-4, Waste Fuel	Soil	PA, SI	NFA DD	NFA
CS-7: OMS-6	Oil	Soil	NFA DD		NFA
CS-8: OMS-22 FS-21: Former Product Tank 90	Unknown	Soil	PA, SI	NFA DD	NFA
CS-9: Former Main USAF Motor Pool	Oils, Solvents, Antifreeze, MOGAS, Paint	Soil	PA	SI and NFA DD	NFA
CS-10: UTES/BOMARC Site FS-24: BOMARC Area CS-10: Source	Waste Fuels, Solvents, JP-4, Aerozine 50, PCBs, Paint	Soil	PA, SI	RI and Source FS	ROD (RD/RA, if necessary)
CS-10: UTES/BOMARC Site FS-24: BOMARC Area CS-10: Groundwater	Solvents	Groundwater	PA, SI, RI	RD (Plume Response Plan)	RA (Pump and Treat, Possible Reactive Wall Technology), LTM
CS-11: Former MAARNG/MAANG Pesticide Shop	Pesticides, Herbicides	Soil	PA, SI	EE/CA	Removal Action
CS-14: Building 156 Vapor Degreaser Leaching Pit	Solvents (TCE,PCE)	Soil	PA, SI	DSRP	NFA DD
CS-15: Former Engine Run-up Trenches	Fuel, Petroleum Distillate 680, Aviation Gas, JP-4	Soil	PA, SI	EE/CA	Removal Action
CS-16: Sewage Treatment Plant CS-17: Former Sewage Sludge Disposal Area	Solvents, Paint Thinner, Contaminated Sewage Sludge	Soil	PA, SI	RI	FS (RD/RA, if necessary)
CS-18: Propellent Burning Area	Propellent Bags	Soil	PA	SI	NFA DD
CS-19: Impact Area Chemical Spill Site	Chemical and Ordnance	Soil	PA, SI	SSI	NFA DD
FS-1: AVGAS Fuel Valve Test Dump Site	AVGAS	Soil Groundwater	PA, SI	RI	FS
FS-2: Railroad Fuel Pumping Site	AVGAS, JP-4	Soil Groundwater	PA, SI	RI	RD/RA - Surface Soils
FS-3: Johns Pond Road Fuel Dumping Site	Fuel, AVGAS, JP-4	Soil	PA, SI	DD	NFA
FS-4: Product Tank 7	Deicing Fluid	Soil Groundwater	PA, SI	Fuel System Upgrade	NFA DD
FS-7: Product Tank 115	Fuel Oil	Soil	PA, SI	RI	NFA DD

Table H-1 (Continued)
Summary Of Installation Restoration Program Sites Currently Under Investigation at MMR

Study Area	Contaminant of Concern	Media	Completed IRP Phase	Current IRP Phase	Future IRP Phase
FS-7: Product Tank 115	Fuel Oil	Soil	PA, SI	RI	NFA DD
FS-9: Product Tank 108	Fuels, Waste Oils, Solvents, Antifreeze	Soil	PA, SI	RI	NFA DD
FS-12: Leak in Fuel Line in Range	JP-4, AVGAS	Groundwater Soil	PA, SI, RI, DD for SVE (IRA)	IRA (Source - Under construction), GW addressed in Plume Response Plan	RA (Source and Pump and Treat)
FS-13: Leak in Underground fuel Line in Cantonment Area	JP-4	Soil	PA	SI	RI/FS or NFA DD
FS-14: Fuel Spill in Range E-3	MOGAS	Groundwater	PA/SI	NFA DD	
FS-16: US Army Helicopter Maintenance Building	JP-4	Soil	PA, NFA DD		NFA
FS-17: WWII Motor Pool/Transfer Point	Diesel Fuel, MOGAS	Groundwater	PA, SI	RI	NFA DD
FS-18: Fuel Transfer Point	Diesel Fuel, MOGAS	Groundwater	PA, SI	Removal Action	NFA DD
FS-19: Former MOGAS/Fuel Storage	Fuel, Hazardous Waste	Groundwater	PA, SI	RI	NFA DD
FS-20: Product Tank 88	Fuel- Potentially Leaking UST	Soil	DD	NFA	NFA
FS-25: Building 167 Area Fuel Spill	Fuel	Soil	RI/FS	EE/CA	NFA
FS-27: Connery Avenue Telephone Line Soil Excavation	Unknown (Waiting for Test Results)	Soil	SI	DD	NFA
FTA-1: Current Fire-Training Area	JP-4, AVGAS, Oils, Thinners, Solvents	Soil	PA, SI, RI, EE/CA	Soil Removal Action	NFA
FTA-2: Former Fire-Training Area LF-2: Probable Former Sanitary Landfill	Waste Oils, JP-4, AVGAS, Solvents, Domestic Refuse	Soil	PA, SI	RI	FS (RD/RA, if necessary)
FTA-3: Former Fire-Training SD-3: Coal and Ash Pile Runoff Storm Drainage Ditch CY-4: Current Coal Storage Yard and Ash Disposal Area	Oils, AVGAS, MOGAS, Solvents, Construction Debris, Coal Ash	Soil Groundwater Sediment	PA, SI	RI	FS (RD/RA, if necessary)
CS-1 (USCG): US Coast Guard Transmitter Station	Waste Solvents	Soil Groundwater	PA, SI, RI, PP and ROD	NFA	NFA
CS-2 (USCG): Hangar 3170 Areas	Chemicals	Soil	PA	PA and DSRP	Removal Action or NFA DD

Table H-1 (Continued)
Summary Of Installation Restoration Program Sites Currently Under Investigation at MMR

Study Area	Contaminant of Concern	Media	Completed IRP Phase	Current IRP Phase	Future IRP Phase
CS-3 (USCG): Base Exchange Automobile Service Station	Waste Fuel, Oil	Soil	PA	SI and DSRP	NFA DD
CS-4 (USCG): Hangar 128 Area FS-1 (USCG): Hangar 128 Fuel Spills	TCE, Toluene, AVGAS	Soil	PA	SI and DSRP	Removal Action or NFA DD
CS-6 (USCG): Other USCG Maintenance Shops	Oil, Solvents, Hydraulic Fluid	Soil	PA	SI	NFA DD
FS-2 (USCG): Hot-Mix Asphalt Plant	Diesel Fuel, Kerosene	Soil	PA	SI and DSRP	Removal Action or NFA DD
FS-26 (USCG): Building 3444 Fuel Tank Area	Diesel Fuel	Soil	PA, Tank and Soil Removal, SI	NFA DD	NFA DD
CY-1: Former US Army Coal Storage Yard	Coal	Soil	DD		
CY-3: Former Hospital/Coal Storage Yard	Coal, Ash	Soil	PA, DD		NFA DD
LF-1 (USCG): Rubble/ Debris Landfill No. 1	Drums	Soil	PA, SI	NFA DD	NFA

Notes:

DD - Decision Document
DSRP - Drainage Structure Removal Program
EE/CA - Engineering Evaluation/Cost Analysis
FS - Feasibility Study
IRA - Interim Remedial Action
LTM - Long Term Measure
MAANG - Massachusetts Air National Guard
MAARNG - Massachusetts Army National Guard
NFA - No Further Action
OU - Operable Unit
PA - Preliminary Assessment
PRE - Preliminary Risk Evaluation
RA - Remedial Action
RAOP - Remedial Action Operation
RD - Remedial Design
RI - Remedial Investigation
ROD - Record of Decision
SI - Site Investigation
SVE - Soil Vapor Extraction
USCG - US Coast Guard

APPENDIX I

TRANSPORTATION

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APPENDIX I
TRANSPORTATION

Regional/Local Access. Regional access to MMR is somewhat limited because it is located on the Cape Cod peninsula bordered by Cape Cod Bay to the north, and Buzzards Bay and Nantucket Sound to the south. Infrastructure providing regional access to MMR consists of several principal arterials with regional significance.

Route 3 connects with Route 6 just south of the Sagamore Bridge, and provides access to MMR from points north of the Cape Cod Canal, such as Boston. Route I-495 to Route 25 provides access to MMR from points northwest of the Cape Cod Canal. From points west of Buzzards Bay, such as Providence, Rhode Island, and New York City, Route I-195 to Route 25 is the major access route. Route 6 provides primary access to MMR from all points east, extending to Provincetown on the tip of the Cape Cod peninsula.

The principle roadways which surround MMR are (see Figure 3-13):

- Route 28 (Bourne), from the Bourne rotary to Route 151;
- Route 6 Bypass (Bourne/Sandwich), from the Bourne rotary to Route 130;
- Route 130 (Sandwich/Mashpee), from Route 6 to Route 28;
- Route 28 (Mashpee), from Route 130 to Route 151;
- Route 151 (Falmouth/Mashpee), from Route 28 (Mashpee) to Route 28 (Bourne).

Local access to MMR is provided by arterials and collector roads which lead directly to an entrance.

West of MMR, access to the main entrance is via Route 28 to Connery Avenue, located east of the Otis rotary in Bourne. Route 28 is the north/south primary arterial intersecting with Connery Avenue at the unsignalized Otis rotary. This main entrance is heavily used by National Guard units and Reserve forces using MMR for AT and/or IDT. The most intensive use of this entrance occurs from May to August, the time frame when most units conduct such training. Based on gate traffic counts conducted for this study, about 47 percent of the total traffic entering or exiting MMR during the summer months does so via the main entrance.

South of MMR, Sandwich Road leads directly to the Falmouth gate entrance. Route 151 is the east/west arterial which intersects Sandwich Road in Falmouth. The Falmouth gate is utilized by about 20 percent of the total traffic entering or exiting MMR. The majority of vehicles entering this gate approach this unsignalized intersection from Sandwich Road northbound.

East of MMR, Route 130 to Snake Pond Road provides access to the Sandwich gate. Route 130 is the north/south arterial which intersects Snake Pond Road just north of the

Sandwich/Mashpee town line. The Sandwich gate is used by approximately 31 percent of the total traffic entering or exiting MMR. The majority of vehicles approach this entrance from Route 130 southbound to Snake Pond Road. Signage at the Sandwich gate prohibits military convoys from exiting onto Route 130.

Also off Route 130 in Sandwich, Gibbs Road provides access to MMR through the Convoy Gate. The Convoy Gate and associated roadway were built to reduce military traffic on roads in the Sandwich community. The gate allows for military convoys to enter MMR shortly after exiting Route 6 onto Route 130. This prevents convoys from having to travel through more heavily populated residential areas further south on Route 130 and along Snake Pond Road, which has a town beach.

The PAVE-PAWS Road entrance, located off the Route 6 Bypass across from Factory Outlet Road, provides access to MMR from the north. This entrance is used by a small contingent of USAF military personnel and civilian contract employees working at the Cape Cod Air Station. This entrance serves approximately 2 percent of the total traffic entering or exiting MMR.

Summer traffic on the roadways providing regional and local access to various locations on Cape Cod are summarized in Tables I-1 and I-2:

Table I-1
Regional Traffic Volumes

Route	Summer 1995 Average Daily Traffic	Estimated 1995 Annual Average Daily Traffic
Route 3[a]	40,500	30,400
Route 25[b]	38,300	28,700
Route 6A[c]	15,470	11,600
Route 6 (at Bourne/Wareham townline)[d]	28,000	21,000
I-495 (Wareham)[d]	50,700	38,000
I-195 (at New Bedford/Dartmouth townline)[d]	68,000	51,000
Route 3 (Plymouth, south of Rt. 44)[d]	65,300	49,000
Route 6 (between exits 2 and 3)[c]	53,700	40,300
Route 28 (North of Otis Rotary)	39,900	29,900
Route 130 (North of Cotuit Road)	21,600	16,200
Route 151(East of Sandwich Road)	18,300	13,700
Route 6 Bypass (east of Bourne Rotary)	9,400	7,050

Notes:

* Estimated using seasonal adjustment factor from Cape Cod Traffic Counting Report
[a] Route 3 volumes are from 1992
[b] Route 25 volumes are 1990 AADT, summer volume is estimated
[c] Volumes are taken from summer 1993
[d] Actual volumes are AADT, summer volume is estimated

Sources: MHD 1994 Traffic Volumes; Cape Cod Traffic Counting Report 1994, VHB Traffic Count, August 1995

Table I-2
Observed Traffic Volumes

Location	Direction	Weekday			Saturday		
		evening			Midday**		
		ADT+	PM Peak Demand	K++	ADT	Peak Demand	K
Route 28 North of Otis Rotary	Northbound	18,800	1,540		19,700	1,520	
	Southbound	21,100	1,670		21,300	1,840	
	Total	**39,900**	**3,210**	**8.0**	**41,000**	**3,360**	**8.2**
Route 28 South of Otis Rotary	Northbound	15,000	1,170		15,300	1,220	
	Southbound	16,500	1,270		16,100	1,450	
	Total	**31,500**	**2,440**	**7.7**	**31,400**	**2,670**	**8.0**
Main Gate	Eastbound (IN)	3,220	270		3,300	325	
	Westbound (OUT)	3,230	460		3,100	270	
	Total	**6,450**	**730**	**11**	**6,400**	**595**	**9**
Falmouth Gate	Northbound (IN)	1,490	120		1,660	185	
	Southbound (OUT)	1,400	195		1,720	175	
	Total	**2,890**	**315**	**11**	**3,380**	**360**	**11**
Sandwich Gate	Eastbound (OUT)	2,190	305		2,170	215	
	Westbound (IN)	2,030	225		2,230	230	
	Total	**4,220**	**530**	**13**	**4,400**	**445**	**10**
PAVE-PAWS Road	Northbound (OUT)	115	25		60	10	
	Southbound (IN)	120	10		60	5	
	Total	**235**	**35**	**15**	**120**	**15**	**13**

* Weekday evening volumes occur Monday through Friday, 4:00 to 6:00 PM.

** Saturday midday volumes occur from 10:00 AM through 3:30 PM.

+ ADT is Average Daily Traffic expressed in vehicles per day.

+ + The "K" factor is the percent of ADT that occurs during the peak hour.

Source: VHB, Inc., August 23-28, 1995

Signalized Intersection Level of Service

Signalized Intersections. Level-of-service for signalized intersections is defined in terms of delay and ranges from level-of-service A (free-flow conditions) to level-of-service F (long delays) (Table I-3). Specifically, level-of-service delay criteria are stated in terms of average stopped delay per vehicle for a 15-minute analysis period. The level-of-service criteria based on delay, along with a brief discussion of the analysis model, are presented in the following subsections of this appendix. Delay represents a measure of driver discomfort, frustration, fuel consumption, and lost time. Delay is a complex measure that depends upon a number of variables such as quality of signal progression, cycle length, allocation of green time, and volume-to-capacity (v/c) ratio. Of all the factors cited, v/c ratios have the least effect on delay. Thus, for any given v/c ratio, a range of delay values, (and, therefore, level of service) may result. Conversely, for a given level of service, the v/c ratio may lie anywhere within a broad range.

Table I-3
Level Of Service Criteria For Signalized Intersections

Level of Service	Stopped Delay per Vehicle (sec)
A	≤ 5.0
B	5.1 to 15.0
C	15.1 to 25.0
D	25.1 to 40.1
E	40.1 to 60.0
F	>60.0

Source: Highway Capacity Manual, Special Report 209; Transportation Research Board, Washington, DC (1985).

The base saturation flow rate used in the signalized intersection analysis model is 1,900 passenger cars per hour of green time per lane (1994 Highway Capacity Manual). This value is adjusted for prevailing traffic conditions such as lane width, left turns, right turns, heavy vehicles, grades, parking, area type, bus blockage, and left turn blockage.

Route 28 at Route 130

Route 28 and Route 130 intersect to form a three-way signalized intersection. The Route 130 approach at this T-type intersection has a median island and consists of one general purpose lane for right and left turning movements onto Route 28. The Route 28 eastbound and westbound approaches each provide one general purpose lane as well.

Approximately 75 percent of the traffic approaching this intersection on Route 130 turns left onto Route 28 eastbound Figures 3-14 and 3-15). Although this approach is striped as one lane, vehicles turning right have ample space to maneuver around the left-turning vehicles. At both Route 28 approaches, only about 15 percent of the total approaching traffic turn onto Route 130 northbound.

This two-phase signalized intersection currently operates at a level-of-service F during both weekend and weekday peak hours (weekend peak demand occurs midday on Saturday, and weekday peak demand occurs during the evening, generally from 4:00 p.m. to 5:00 p.m.). This is principally a result of the Route 28 eastbound approach where left-turning vehicles hinder the flow of through vehicles. There is one approach lane and inadequate shoulder width to allow through vehicles to maneuver around left turning vehicles once several left-turning vehicles are queued up. The Route 130 and Route 28 westbound approaches operate at a level-of-service C during peak demand.

Unsignalized Intersection Level of Service

Level-of-service for unsignalized intersections is based on the number of acceptable gaps in the major street traffic flow that may be used by minor street vehicles. The criteria shown in Table I-4 are based on the available reserve (or unused) capacity (measured in passenger cars per hour) for the movement in question. The table also includes a qualitative index of delay.

Table I-4
Level-Of-Service Criteria For Unsignalized Intersections

Reserve Capacity	Level-of-Service	Expected Delay to Minor Street Traffic
>400	A	Little or no delay
300-399	B	Short traffic delays
200-299	C	Average traffic delays
100-199	D	Long traffic delays
0-99	E	Very long traffic delays
<0	F	Extremely long traffic delays*

Queuing may cause severe congestion affecting other traffic movements in the intersection. This condition usually warrants improvement to the intersection.
Source: 1985 Highway Capacity Manual

Route 151 (Nathan Ellis Highway) at Sandwich Road

Route 151 and Sandwich Road intersect to form a four-way unsignalized intersection. The Sandwich Road northbound approach provides direct access to the MMR Falmouth gate. Both Sandwich Road approaches are controlled by stop signs.

The Sandwich Road approaches provide an exclusive left-turn lane and a general purpose lane for right-turning movements and through traffic. Due to the considerable volumes and almost continuous flow of traffic on Route 151 during peak demand, turning movements from both northbound and southbound approaches are difficult to make Figures 3-14 and 3-15). All turning movements at the Sandwich Road northbound and southbound approaches operate at level-of-service F during the weekday evening and Saturday midday peak demand as a result of few and sporadic opportunities to safely enter and/or cross Route 151.

Accident data for 1994 and 1995 obtained from the Town of Falmouth Police Department revealed that approximately 70 percent of the reported accidents at this intersection involved vehicles turning onto Sandwich Road or onto Route 151. The remaining accidents were either rear-end collisions or unspecified.

Route 130 at Snake Pond Road

Route 130 and Snake Pond Road intersect just north of the Sandwich/Mashpee town line to form a four-way, unsignalized intersection. The Snake Pond Road westbound approach provides access to the MMR Sandwich gate. Both Snake Pond Road approaches are controlled by stop signs.

The Snake Pond Road approaches are striped as single lanes, but adequate road width allows for operation as two lanes. Left-turning movements from both Snake Pond Road approaches operate at level-of-service F during peak evening and Saturday demand. The low level-of-service observed for the left-turning movements from the minor approaches at this intersection are a result of relatively heavy traffic volumes on Route 130 providing limited gaps for side street traffic and delaying movements from the minor approaches (Figures 3-14 and 3-15).

Route 130 at Cotuit Road

Route 130 and Cotuit Road intersect to form a three-way unsignalized intersection. The Cotuit Road approach at this T-type intersection is controlled by a stop sign and consists of separate lanes for right and left turns onto Route 130. The Route 130 southbound approach consists of separate lanes for through and left-turning movements. The Route 130 northbound approach consists of one general purpose lane.

The left-turn movements from Cotuit Road operate at a level-of-service D during peak evening demand, and level-of-service E during peak Saturday demand (Figures 3-14 and 3-15). Because of the heavy flow of traffic on Route 130, queuing and delays for southbound left-turning traffic result in a level-of-service D condition during peak demand.

Caution should be used in the interpretation of the unsignalized LOS criteria, which are not associated with the delay values given for signalized intersections. Level-of-service F indicates that there are insufficient gaps of suitable size to allow side or minor street traffic to safely enter or cross the major street traffic. This is generally evident by long delays and possible by queuing on the minor street. Additionally, adequate gaps may not be available for vehicles turning left from the major street. Level-of-service F may also result in vehicles accepting smaller than usual gaps. In such cases, safety may be compromised and disruption to the major street traffic can result.

Level-of-service F conditions usually warrant investigation into possible improvements to the intersection. The most common improvement for such situations is installing a traffic signal to provide a break in the main street traffic, allowing side street movements. This type of mitigative strategy can only happen where traffic flows are significant enough to warrant signalization.

Route 130 at Snake Pond Road

Route 130 and Snake Pond Road intersect just north of the Sandwich/Mashpee town line to form a four-way, unsignalized intersection. The Route 130 northbound and southbound approaches consist of one general purpose land for through traffic and turning movements. Through traffic consists of about 85 percent of northbound traffic on Rout 130. Southbound traffic consists of about 58 percent through, and 35 percent right-turn movements onto Snake Pond Road. During peak demand, the northbound approach operates at a level-of-service A as a result of few left-turning movements onto Snake Pond Road. Likewise, the southbound approach operates at level-of-service A, resulting from adequate shoulder width which allows through traffic to maneuver around right-turning traffic.

Route 130 at Cotuit Road

About 95 percent of the traffic approaching this intersection from Route 130 northbound remain on Route 130. The majority (57 percent) of traffic traveling on Route 130 southbound turn left onto Cotuit Road. From Cotuit Road, about 98 percent of vehicles proceed northbound onto Route 130.

Traffic Rotaries. The capacity analysis on an unsignalized rotary is based on a methodology outlined in Transportation and Traffic Engineering Handbook (Institute of Transportation Engineers, 1982). The measurement criteria includes: rotary pavement width in the weaving sections; length of the weaving sections; average roadway width at the entrances to the weaving sections; and the proportion of weaving traffic to total traffic.

The resultant level-of-service is based on the ratio of the number of vehicles which could be served versus the actual vehicular demand. The rotary analysis criteria used to determine the level-of-service is presented in Table I-5.

Table I-5
Level Of Service Criteria For Traffic Rotaries

Level of Service	Volume-to-Capacity Ratio
A	< 0.60
B	0.61 to 0.70
C	0.71 to 0.80
D	0.81 to 0.90
E	0.91 to 1.00
F	>1.00

Source: Transportation and Traffic Engineering Handbook, Institute of Transportation Engineers, 1982.

Bourne Rotary

The Bourne rotary is a four-way unsignalized traffic circle with Route 28 as the north and south approaches. Sandwich Road (Route 6 Bypass) is the east approach and Towbridge Road is the west approach. All approaches are one lane except for Route 28 southbound, which is two lanes. The weaving portions of the rotary are wide enough to provide an inside and outside lane.

In the peak periods analyzed, the heaviest demand on this rotary is from southbound vehicles crossing the Bourne Bridge (Figures 3-14 and 3-15). The critical weaving portion is between Towbridge Road and the Route 28 south approach to the rotary. Because of a relatively short weaving section, existing traffic volumes result in a level-of-service D operation during peak evening demand and a level-of-service E operation during peak Saturday demand.

Otis Rotary

The Otis rotary is a four-way unsignalized traffic circle with Route 28 as the north and south approaches. Lake Drive Extension is the west approach and Connery Avenue is the east approach. All approaches are one lane and the weaving portions of the rotary are wide enough to provide an inside and outside lane.

The majority of traffic enters this rotary via the Route 28 southbound approach in the peak periods analyzed (Figures 3-14 and 3-15). The rotary operates at level-of-service B during both periods of peak demand.

Safety Analysis. In order to identify accident trends in the study area, traffic accident reports were requested from the Massachusetts Highway Department and local police departments from January 1, 1993 to December 31, 1995 for the six key intersections. The results are presented in Table I-6. This table presents only incidents which were reported to, or involved, the police department. Unreported incidents resolved between the involved motorists without police assistance are not accounted for. The following table presents the results of a safety analysis.

Table I-6
Accident Summary (1993 - 1995)

Year:	Number of Accidents					
	Bourne Rotary[a]	Otis Rotary[a]	Route 151/ Sandwich Road[b]	Route 28/ Route 130[c]	Route 130 / Snake Pond Road[d]	Route 130/ Cotuit Road[d]
1993	10	11	6	0	4	4
1994	15	5	4	NA	3	3
1995	17	6	5	NA	3	6
Total	42	22	15		10	13
Type:						
Angle	22	6	11	NA	7	2
Rear-end	8	3	2	NA	3	9
Other	12	13	2	NA	0	2
Total	42	22	15		10	13
Severity:						
PDO*	35	16	8	NA	6	6
Personal Injury	7	6	7	NA	4	7
Fatality	0	0	0	NA	0	0
Total	42	22	15		10	13
Time of Day:						
7:00 to 9:00 AM	4	1	0	NA	3	1
4:00 to 6:00 PM	6	5	2	NA	1	4
Remainder of Day	32	16	13	NA	6	8
Total	42	22	15		10	13

Table I-6 (Continued)
Accident Summary (1993 - 1995)

Year:	Number of Accidents					
	Bourne Rotary[a]	Otis Rotary[a]	Route 151/ Sandwich Road[b]	Route 28/ Route 130[c]	Route 130 / Snake Pond Road[d]	Route 130/ Cotuit Road[d]
Pavement Condition						
Dry	22	14	13	NA	4	10
Wet/Ice/Snow	19	7	5	NA	6	3
Unreported	1	1	2	NA	0	0
Total	42	22	20		10	13

* Property Damage Only
a Source: 1993 data from Massachusetts Highway Department (MHD), 1994 and 1995 data from Bourne Police Dept.
b Source: 1993 data from MHD, 1994 and 1995 data from Falmouth Police Dept.
c Source: 1993 data from MHD, [1994 and 1995 data is forthcoming from Mashpee Police Dept.]
d Source: 1993 data from MHD, 1994 and 1995 data from Sandwich Police Dept.

As expected, the number of reported incidents at the Bourne and Otis rotaries from 1993 to 1995 was higher than the other intersections, most likely resulting from weaving conflicts in the rotaries and higher volumes. The volume of vehicles using these two rotaries was much higher than the other intersections in the study area.

The percentage of personal injury incidents reported at the Bourne and Otis rotaries from 1993 to 1995 was much lower than those reported at the non-signalized intersections. Weaving incidents, which frequently occur in traffic rotaries, generally involve lower speed collisions resulting in property damage only. The higher percentage of personal injury incidents occurring at the non-signalized intersections in the study area is probably a result of motorists pulling out from the minor approach, and colliding with a higher speed vehicle on the major approach. There were no fatal incidents reported at study area intersections from 1993 to 1995.

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GLOSSARY OF TERMS

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GLOSSARY

A-weighted Sound Level. A number representing the sound level which is frequency weighted to emphasize the high frequency components of continuous noise such as aircraft noise.

Advisory Council on Historic Preservation. A 19 member body appointed, in part, by the President of the United States to advise the President and Congress and to coordinate the actions of federal agencies on matters relating to historic preservation, to comment on the effects of such actions on historic and archeological cultural resources,a nd to perform other duties as required by law (Public Law 89-655; 16 USC 470)

Air Installation Compatible Use Zone. A U.S. Air Force land use planning procedure employed to control environmental noise.

Aircraft Generation Unit Facility (AGU). An aircraft facility to provide hangar, workshop and office space for the minor pre-flight maintenance and repair to Air National Guard aircraft. Pre-flight maintenance activities include diagnostic testing, fluids and systems inspection, and other minor repair immediately prior to taxiing for takeoff.

Ambient Air Quality Standards. Standards established on a state or federal level that define the limits for airborne concentrations of designated "criteria" pollutants (nitrogen dioxide, sulfur dioxide, carbon monoxide, ozone, lead, and particulate matter) to protect public health with an adequate margin of safety (primary standards) and to protect public welfare, including plant and animal life, visibility, and materials (secondary standards).

Aquifer. The water-bearing portion of subsurface earth materials that yields or is capable of yielding useful quantities of water to wells.

Archeology. A scientific approach to the study of human ecology, cultural history, and cultural processes through the interpretation of material remains.

Army National Guard. Military reserve units controlled by each state, equipped by the federal government, and subject to the call of either federal or state government.

Artillery. Large caliber weapons such as cannons and rocket launchers.

Asbestos-containing Material. As defined by USEPA, any material that contains more than 1 percent asbestos.

Battalion. A military unit comprised of approximately 500 to 800 soldiers.

Berm. An earthen ridge created behind a range target to stop projectiles and prevent ricochets.

Bivouac. Troop encampment.

C-weighted Sound Level. A number representing the sound level which is frequency weighted to emphasize the low frequency components of impulsive noise such as from weapons firing.

Cantonment Area. The developed portion of a permanent military installation. The portion of MMR used as an administrative area containing administration, maintenance, and billeting areas.

Carbon monoxide (CO). A colorless, odorless, poisonous gas produced by the incomplete combustion of fossil fuel. One of the six pollutants for which there are NAAQS and state ambient air quality standards.

Conformity Rule. Requires USEPA promulgated the General Conformity Rule (effective January 31, 1994) to ensure that activities of Federal agencies do not inhibit reaching goals of federal and state implementation plans. The rule requires Federal agencies to review new actions and decide whether the actions would worsen an existing NAAQS violation, cause a new NAAQS violation, delay the implementation plan attainment schedule of the NAAQS, or otherwise contradict implementation plan requirements.

Company. A military unit comprised of approximately 80 to 150 soldiers, depending on the type of unit.

Council on Environmental Quality. Established by NEPA, the CEQ consists of three members appointed by the President of the United States. CEQ regulations describe the process for implementing NEPA, including preparation of environmental assessments and EISs, and the timing and extent of public participation.

Criteria Pollutants. The Clean Air Act required the USEPA to set air quality standards for common and widespread pollutants after preparing "criteria documents" summarizing scientific knowledge on their human health effects. Today, there are six "criteria pollutants": nitrogen dioxide, carbon monoxide, sulfur dioxide, ozone, particulate matter, and lead.

Cultural Resources. Objects, sites, structures, buildings, districts, or any other physical remain used by humans in the past. These nonrenewable resources may be prehistoric, historic, architectural, or archival in nature.

Cumulative Impact. Two or more individual effects that, when considered together, are considerable or that compound or increase other environmental impacts.

Decibel. A unit of measurement on a logarithmic scale that describes the magnitude of a particular quantity of sound pressure or power with respect to a standard reference value.

Determination of Eligibility. Finding by the Secretary of the Interior or his/her designee that a district, site, building, structure, or object meets the criteria for listing on the National Register of Historic Places.

Endangered Species. A species that is threatened with extinction throughout all or a significant portion of its range.

Environmental Notification Form (301 CMR 11.28[ENF]). A form provided to the Secretary of Environmental Affairs by a project proponent that begins the MEPA review process.

Firer. A vehicle or soldier that is in position to fire at target.

Firing Lane. The line of positions from which fire is directed against a target or row of targets.

Firing Points. The location at which a vehicle or weapon is positioned for firing at a target.

Firing Positions. The location on a firing range at which a vehicle or weapon is positioned for firing at a target.

Firing Range. The area or group of firing points designed for use of a particular weapon.

Hazardous Material. Generally, a substance or mixture of substances that has the capability of wither causing or significantly contributing to an increase in mortality or increase in serious irreversible or incapacitating reversible illness; or posing a substantial present or potential risk to human health or the environment.

Hazardous Waste. A waste or combination of wastes which, because of its quantity, concentration, or physical, chemical or infectious characteristics, may either cause, or significantly contribute to, an increase an increase in mortality or an increase in serious irreversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of or otherwise managed.

Historic Context. An organizing structure for interpreting history that groups information about historic properties that share a common theme, common geographic area, and a common time period. The development of historic contexts is a foundation for decisions about the planning, identification, evaluation, registration, and treatment of historic properties, based upon comparative historic significance.

Hydrocarbons. Any of a vast family of compounds containing hydrogen and carbon. Defined loosely to include many organic compounds in various combinations, most fossil fuels are composed predominantly of hydrocarbons. When hydrocarbons mix with nitrogen oxides in the presence of sunlight, ozone is formed; hydrocarbons in the atmosphere contribute to the formation of ozone.

Impacts. An assessment of the meaning of changes in attributes being studied for a given resource; an aggregation of the adverse effects, usually measured using a qualitative and nominally subjective technique. In this EIS, as well as in CEQ regulations, the word impact is used synonymously with the word effects.

Impact Area. A safety area designated for use by soldiers firing weapons where bullets and other munitions can be safely aimed and/or detonated.

Infantry Squad Battle Course (ISBC). A range used to train infantry soldiers how to conduct small group tactical movements and attack enemy positions.

Installation Compatible Use Zone. A U.S. Army land use planning procedure employed to control environmental noise.

Installation Restoration Program. A DoD program to identify, characterize, and remediate environmental contamination on its installations.

Large Quantity Generator. A facility (or group of facilities) that generate greater than 1,000 kilograms of hazardous wastes or 1 kg of acutely hazardous wastes per month.

Lead (Pb). A heavy metal used in industry, which can accumulate in the body and cause a variety of negative effects. One of the six pollutants for which there is a NAAQS.

Level of Service. In transportation analyses, a qualitative measure describing operational conditions within a traffic stream and how they are perceived by motorists and/or passengers.

Massachusetts Military Reservation (MMR). MMR is an approximately 21,000 acre military complex located on the upper or western portion of Cape Cod in Barnstable County, Massachusetts. This military complex is home to several federal and state agencies including: MAARNG (Camp Edwards Training Site); MAANG (Otis ANGB); USCG (Air Station Cape Cod); the U.S. Air Force; the Veterans Administration; the U.S. Marine Corps; the U.S. Department of Agriculture; and the Federal Aviation Administration.

Massachusetts Environmental Policy Act (MEPA). Massachusetts General Law (MGL) c. 30, s. 61-62H and 301 CMR 11.00. MEPA applies to the activities of all agencies of the Commonwealth, to all activities carried out with financial assistance from state agencies, and to all activities which require permits granted by state agencies. The Commonwealth's equivalent to NEPA.

MEPA Certificate (301 CMR 11.06). A certificate (regarding a proposed project) issued by the Secretary of Environmental Affairs that states whether or not an EIR is required. The Certificate determines the form, content, level of detail, and the alternatives required for the EIR.

Maximum Reasonable Capacity. In terms of this EIS/EIR, the maximum number of soldiers a range at MMR could support, assuming 100 percent efficiency and use, in one training year.

Military Operations on Urbanized Terrain-Collective Training Facility (MOUT-CTF). The continuation of MOUT training, used to train small or large group techniques used in urban combat situations.

Military Operations on Urbanized Terrain-Military Assault Course (MOUT-MAC). A group of facilities designed to train individuals or small groups on techniques used in urban combat situations.

Mitigation. (In context of this EIS) To make less harsh or severe; to alleviate effects; includes the concept of avoidance.

Modified Record Fire Range (MRFR). A firing range used to train and qualify soldiers on the M16 rifle.

Mortar. A muzzle-loading weapon used to for high-trajectory munitions indirectly at a target.

Multi-Purpose Machine Gun Transition Range (MPMR). A firing range used to train and qualify soldiers on various machine guns and the sniper rifle.

National Ambient Air Quality Standards. Section 109 of the Clean Air Act requires USEPA to set nationwide standards for widespread air pollutants. Currently, six pollutants are regulated by primary and secondary NAAQS: nitrogen dioxide; sulfur dioxide; carbon monoxide; ozone; lead; and particulate matter.

National Environmental Policy Act. Public Law 91-190, passed by Congress in 1969, established the Council on Environmental Quality and requires federal agencies to consider the environment when planning and executing major actions. NEPA procedures also require federal agencies to involve the public early in the decision-making process.

National Register of Historic Places. A register of districts, sites, buildings, structures, and objects important in American history, architecture, archeology, and culture, maintained by the Secretary of the Interior under authority of Section 2(b) of the Historic Sites Act of 1935 and Section 101(a)(1) of the National Historic Preservation Act of 1966, as amended.

Native Americans. Used in a collective sense to refer to individuals , bands, or tribes who trace their ancestry to indigenous populations of North America prior to Euro-American contact.

Nitrogen Dioxide (NO_2). Gas formed primarily from atmospheric nitrogen and oxygen when combustion takes place at high temperature. Nitrogen dioxide emissions contribute to acid deposition and formation of atmosphere ozone. One of the six pollutants for which there is a NAAQS.

Nitrogen Oxides (NO_x). Gases formed primarily by fuel combustion that contribute to the formation of acid rain. Hydrocarbons and nitrogen oxides combine in the presence of sunlight to form ozone.

Noise. Any sound that is undesirable because it interferes with speech and hearing , or is intense enough to damage hearing, or is otherwise annoying (unwanted sound).

Noise Contour. A curve connecting points of equal noise exposure on a map.

Nonattainment Area. An area that has been designated by USEPA or the appropriate state air quality agency, as exceeding one or more NAAQS.

Notice Of Intent. A written notice published in the Federal Register that announces the intent to prepare an EIS and provides information about a proposed federal action, alternatives, the scoping process, and points of contact within the lead federal agency regarding the EIS.

Notice of Project Change (301 CMR 11.17). A notice to the Secretary of Environmental Affairs provided by a by a project proponent if a proposed project changes, if more than three years have elapsed between the filing of an ENF and filing of a Final EIR, or if more than five years have elapsed between filing of a Final EIR and substantial commencement of the project.

Ozone (O_3). Ozone is produced from reactions of hydrocarbons and nitrogen oxides in the presence of sunlight and heat. Ozone is a major contributor to smog. One of the six pollutants for which there is a NAAQS.

Particulate Matter (PM). Particles of various diameter small enough to be airborne. One of the six pollutants for which there is a NAAQS.

Peak-hour Traffic. The hourly volume of traffic during the maximum volume hour of the day divided by the peak 15-minute rate of flow within the peak hour. A measure of traffic demand fluctuation within the peak hour.

Platoon. A military unit consisting of approximately 30 to 40 soldiers.

Prehistoric. The period of time before the written record.

Projected Annual Utilization. In terms of this EIS/EIR, the number of soldiers realistically expected to use a range at MMR while allowing for such factors as unit inefficiency and range availability.

Ranges. A portion of a training area designated for firing weapons and explosive devices.

Record of Decision. In terms of an EIS, a record of decision is a notice published in the Federal Register that contains the lead agency's decision, and identifies the alternatives considered and mitigation measures to be used.

Scoping. Early consultation with federal and state agencies, and interested public to identify possible alternatives and the significant issues to be addressed in an EIS.

Safety Danger Zone. A safety zone around the target area that includes where the projectile is aimed to strike, an additional area for flying fragments or ricochetting projectiles, and a third area set aside as a further safety buffer zone.

Small Arms. Firing or marksmanship training involving small-caliber arms (e.g., pistols, rifles, and light machine guns).

Small Quantity Generator. A facility or group of facilities that generates less than 1,000 kg and/or less than 1 kg of acutely hazardous wastes per month.

State Historic Preservation Officer. The official within each state, authorized by the State at the request of the Secretary of the Interior, to act as liaison for purposes of implementing the National Historic Preservation Act.

Sulfur Dioxide (SO_2). A toxic gas that is produced when fossil fuels are burned. Sulfur dioxide is the main pollutant involved in the formation of acid rain. One of the six pollutants for which there is a NAAQS.

Tactics. Deploying soldiers and equipment in coordinated maneuvers against an enemy.

Threatened Species. Plant and wildlife species likely to become endangered in the foreseeable future.

Throughput. In terms of this EIS/EIR, the maximum number of soldiers who could use a firing range at MMR per a given unit of time (e.g., daily, annually); or the projected amount of ammunition fired at a range at MMR assuming a known number of soldiers (and weapons) using that particular range for a given period of time.

Vernal Pools. Topographical depressions underlain by a hardpan soil layer in which seasonal rains accumulate, forming pools that can support a highly adapted ecosystem.

Very Small Quantity Generator. A facility or group of facilities that generates less than 100 kgs of hazardous waste and no acutely hazardous waste per month.

Wetlands. Areas that are inundated or saturated with surface or groundwater at a frequency and duration sufficient to support a prevalence of vegetation typically adapted for life in saturated soil. This classification includes swamps, marshes, bogs, and similar areas.

Zeroing. Zeroing a weapon includes aligning the weapon sight with the barrel so a bullet impacts the point of aim at a given distance. The standard battle sight zero range is 25-m.

ACRONYMS AND ABBREVIATIONS

ACHP	Advisory Council on Historic Preservation
ACM	asbestos-containing materials
ADNL	A-weighted, Day-Night Sound Level
AEW&C	Airborne Early Warning and Control Wing
AFB	Air Force Base
AFI	Air Force Instruction
AGU	Aircraft Generation Unit
AHPA	Archeological and Historic Preservation Act
AICUZ	Air Installation Compatible Use Zone
AIRFA	American Indian Religious Freedom Act
ANGB	Air National Guard Base
APG	Aberdeen Proving Ground
AQCR	air quality control regions
AQSB	Air Quality Surveillance Branch
ARPA	Archeological Resources Protection Act
AST	aboveground storage tank
AT	Annual Training
bls	below land surface
BOMARC	Boeing Michigan Aeronautical Research Center
B.P.	before present
CAA	Clean Air Act
CAAA	Clean Air Act Amendments
CDNL	C-weighted DNL
CEQ	Council on Environmental Quality
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
cf	cubic feet
CFR	Code of Federal Regulations
CMR	Code of Massachusetts Regulations
CO	carbon monoxide
CWA	Clean Water Act
CWG	Community Working Group
cy	cubic yard

DACA	Department of the Army Contract Agreement
dB	decibels
dBA	decibels, A-weighted
DBH	Diameter at Breast Height
dBP	decibels, peak
DNL	Day-Night Sound Level
DoD	Department of Defense
DRMO	Defense Reutilization Marketing Office
EA	Environmental Assessments
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENF	Environmental Notification Form
EO	Executive Order
EOEA	Massachusetts Executive Office of Environmental Affairs
°F	Fahrenheit
FAA	Federal Aviation Administration
ft	feet
FY	Fiscal Year
GIS	geographic information system
gpd	gallons per day
gpm	gallons per month
HMX	High Melting Explosive
IBC	Infantry Battle Course
ICUZ	Installation Compatible Use Zone (Army)
IDT	Inactive Duty Training
IRP	Installation Restoration Program
ISBC	Infantry Squad Battle Course
kVA	kilovolt-ampere
KWH	kilowatt-hours
lbs	pounds
lbs/year	pounds per year
LOS	level of service
LQG	large quantity generator

m	meter
MADEP	Massachusetts Department of Environmental Protection
MAANG	Massachusetts Air National Guard
MAAQS	Massachusetts Ambient Air Quality Standards
MAARNG	Massachusetts Army National Guard
MEPA	Massachusetts Environmental Policy Act
MGD	million gallons per day
MGL	Massachusetts General Law
MHC	Massachusetts Historical Commission
$\mu g/m^3$	micrograms per cubic meter
mm	millimeter
MMD	Massachusetts Military Division
MMR	Massachusetts Military Reservation
MOUT-CTF	Military Operations on Urbanized Terrain-Collective Training Facility
MOUT-MAC	Military Operations on Urbanized Terrain-Military Assault Course
MP	Military Police
mph	miles per hour
MPMR	Multi-Purpose Machine Gun Transition Range
MRFR	Modified Record Fire Range
msl	mean sea level
MWPA	Massachusetts Wetlands Protection Act
NAAQS	National Ambient Air Quality Standards
NAGPRA	Native American Graves Protection and Repatriation Act
NE	northeast
NEPA	National Environmental Policy Act
NHESP	National Heritage and Endangered Species Program
NGB	National Guard Bureau
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOA	Notice of Availability
NOI	Notice of Intent
NPC	Notice of Project Change
NPL	National Priorities List
NW	northwest
NRHP	National Register of Historic Places
O_3	ozone

PAVE-PAWS	Precision Acquisition Vehicle Entry-Phased Array Warning System
PCBs	polychlorinated biphenyls
PFTS	Permanent Field Training Site
PM_{10}	Particulate Matter with a diameter of 10 microns (one millionth of one meter) or less
POV	privately owned vehicle
ppm	parts per million
PSD	Prevention of Significant Deterioration
RCRA	Resource Conservation and Recovery Act
RDX	Royal Dutch Explosive
RFMSS	Range Facility Management Support System
SARA	Superfund Amendments and Reauthorization Act
SDZ	surface danger zone
SE	southeast
sf	square feet
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
SQG	small quantity generator
TPY	tons per year
TSCA	Toxic Substance Control Act
U.S.	United States
USACERL	U.S. Army Construction Engineering Research Laboratory
USACOE	U.S. Army Corps of Engineers
USAF	United States Air Force
USCG	U.S. Coast Guard
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFWS	U.S. Fish and Wildlife Service
USMC	U.S. Marine Corps
USN	U.S. Navy
UST	underground storage tank
UTES	Unit Training Equipment Site
VA	Veterans Administration
v/c	volume-to-capacity
VOC	volatile organic compounds
VSQG	very small quantity generator
WWTP	wastewater treatment plant

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